SMITHSONIAN DEPOSIT
JUL 2 1879


# THE AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY.

Publishing Office, No. 42 Pine Street.

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME XXIX.—No. 12. Whole No. 468. | NEW YORK, MONDAY, DECEMBER 16, 1878. | $3 PER ANNUM IN ADVANCE.

A. M. CALLENDER & CO., Proprietors.
G. WARREN DRESSER, Editor.


## CONTENTS.

☞ An asterisk (*) denotes an illustrated article


EDITORIALS—

The Electric Light....265
Present State of Electric Lighting....265
Sixth Annual Meeting of the American Gas-Light Association. [Official Report]....266
Explosions....271
The Electric Light and Lighting by Electricity....271
The Electric Light....272
Let There be Light....275
Gas as Fuel....275
The Origin of Horn Lanterns....276
Growth of the Steam Engine....276
King's Treatise....276
A Fatal Accident....277

CORRESPONDENCE—

Coke in Cleveland....277
Death of Samuel Lewis, Pres. Detroit Gas-Light Company.277
Experimental Determination of the Velocity of Light....278
System of Ventilating and Purifying Sewers....278
Ammoniacal Liquors....278



WISHING TO MAKE THIS JOURNAL an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit Correspondence for publication from all among them who make the study of these subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS*, or *POST OFFICE MONEY ORDERS—ONLY.*

The price of this Journal is, in advance, **$3.00 per Annum. Single Copies Fifteen Cents.**

☞ NEWS AGENCY.—The American News Company, Chamber street, New York agents for this Journal. News dealers will please send orders to them.

☞ All communications to be addressed to **"The Proprietors,"** No. 42 Pine Street, Room 18, New York.

## TO OUR SUBSCRIBERS AND PATRONS

In making remittances for subscriptions, always procure a draft on New York, or a POST OFFICE MONEY ORDER, if possible. Where neither of these can be procured, send the money, but always in a REGISTERED LETTER. The registration fee has been reduced to ten cents, and the registration system has been found by the postal authorities to be actually an absolute protection against losses by mail. ALL Postmasters are obliged to register letters whenever requested to do so.

### NOTICE.

☞ *All Collections for Advertisements, Subscriptions, etc., are made directly from this Office. We have Agents to solicit the same They are not authorized to Receive for Money.*


## THE ELECTRIC LIGHT.

With this issue we close the report of the proceedings of the American Gas-Light Association at their annual meeting last October. In our next number we shall commence the publication of the Lecture by Prof. Morton, which has been carefully revised and extended by the Prof., and will be fully illustrated with various cuts, some of which are new, and have never been before published in this country. It has been suggested that the lecture be published in pamphlet form; and as it appears in the JOURNAL, if there should be sufficient indication of a demand for the same, we shall immediately, upon the completion of it, republish the whole in that shape.

We feel that an apology is due our readers for the apparent surfeit that we are giving them upon this subject of electric light; but when a so-called novelty is presented that claims for itself, or permits others to claim for it, such wonderful things as are constantly set forth as the truth in regard to this matter, we deem it due to our readers to present to them such fair and candid statements, as to the other side of the question, as are to be found emanating from men of unquestioned ability, integrity and fairness.

Our own views have not changed from those expressed in the report of investigations at Paris, published on October 16th; and while many of the cleverest minds are at work at this problem, still much of the success talked about is only *promised* or *hoped for*. So much absurdity is printed upon this subject that one is necessarily loth to say anything at present, but rather quietly wait for the development of facts, which, if we are not greatly mistaken, will go far to prove the truth of the old army adage, viz.: "It is not safe to believe anything you hear, and not more than half of what you see." As an instance, we take a single case: A daily paper stated last week that Mr. Edison's 80-horse power engine would, when he had made his new dynamo machine, furnish 480 lights, equal to ordinary gas lights, *at a cost of* $1.95 *each per annum*. Now, it is easy to determine the amount of coal ordinarily used to run an 80-horse engine 24 hours a day for 365 days. If the engine consumed 10 lbs. of coal per h.p. per hour, it would require 3,128 tons of coal to run it one year, and also engineers and firemen that would cost, in wages, about $10 a day, so that the account would be simply for fuel and enginemen:

| | |
|---|---|
| 3,128 tons coal, at $4 | $12.512 |
| 365 day's wages, at $10 | 3,650 |
| Making | 16,162 |

dividing this by number of lights, 480, gives the sum of $33.66 per light per annum, with nothing allowed for electric machines, their attendance, etc. This calculation need not be continued to show the absurdity of the original newspaper story. Still, many "believe everything they see in the paper," and never stop to reflect whether there is reason in a statement or not. The electric light, in its own sphere, is a useful, powerful, brilliant illuminating agent; but it has not yet been either stored, distributed, or sold on a commercial basis for general purposes. Until that can be done gas companies ought to increase their send out yearly, of a good honest sixteen candle gas, see that it is properly burned, charge reasonable prices, and pay good dividends on a capital that is equal to anything like a fair valuation of their plant. Strict economy, good organization, and a strictly scientific proceedure in their manufacture, is the proper way to enable them to compete with all sources of light except the sun.

## PRESENT STATE OF ELECTRIC LIGHTING.

[By J. N. SCHOOLBRED, B.A., Mem. Inst. C. E., London, 1878.]

We have to acknowledge the courtesy of the author in forwarding us his very interesting pamphlet under the above title. It is a paper which was read before Section G. of the British Association at the Dublin meeting in August last, and is valuable as setting forth, very truthfully and fully by words and illustrations, the most successful apparatus invented up to that date for the purposes of electric lighting. In speaking of the prospects of the light, he says:

"Much is said of electricity replacing gas. The fields of each, at present, at least, lie apart. * * While into the special domain of gas-lighting, the illumination of private houses, electricity *cannot* in its present form pretend to enter."

Speaking of the cost of electric lights; in the single item of carbon points we have an expense varying from four to twelve cents per hour for each light. This publication is to serve as an introduction to a paper, to be read before the Society of Arts in London at an early day, on "The Practical Application of Electricity to Lighting Purposes,"

[Official Report.—Continued from page 248.]

## SIXTH ANNUAL MEETING OF THE AMERICAN GAS-LIGHT ASSOCIATION.

HELD AT THE FIFTH AVE. HOTEL, N. Y., OCT. 16, 1878.

### THIRD DAY.

The Association met at 10 A.M., pursuant to adjournment, and was called to order by the President.

On motion, the reading of the minutes of the proceedings of yesterday's meeting was dispensed with.

Mr. Neal—I move that the thanks of the Association be tendered to Prof. Morton for the instructive and interesting lecture delivered by him in the presence of this Association, and others, last evening, at the Stevens Institute. Carried.

The Executive Committee then made the following report:

The Executive Committee offer the following recommendations—

*On Motion*, It was resolved to recommend that hereafter the fiscal year shall be considered closed on Sept. 30th of each year.

*On Motion*, Further recommended to amend Art. I. of the Constitution, by striking out the last clause.

*On Motion*, Also, that Sec. XVII. be amended, by striking out "In the City of New York," etc., leaving it as follows: "The Annual Meeting of the Association shall be held on the 3d Wednesday of October, of each year, at 10 o'clock, A.M., at such place as shall be designated by the Association at the previous annual meeting."

*Also*, Amend Art. XXVIII., so as to read: "No member who shall be two years in arrears shall be entitled to vote, or to participate in the deliberations of the Association."

*Also*, It was recommended that the next annual meeting of the Association be held in the city of Philadelphia.

*Also*, That the vote upon the recommendation relative to printing be reconsidered, and that the proceedings be printed in a volume similar to the last preceding volume.

*Also*, That the same committee be appointed to have the printing done.

*Also*, Recommended that Prof. Henry Morton be elected an Honorary Member of this Association.

*Also*, That the Secretary be and he is hereby directed not to furnish copies gratuitously to any member who is in arrears for annual dues.

The Committee ask the approval of this report.

W. H. Denniston,
*Chairman.*

On motion, the report was received.

The President—So far as the recommendation of the committee is concerned, in relation to alterations in the Constitution, that is a matter that must lie over until the next Annual Meeting. The first recommendation of the committee that requires the present action of the Association is "that hereafter the fiscal year shall be considered closed on the 30th of September of each year."

Mr. Denniston—The secretary and the finance committee have had some difficulty in fixing the time at which they can close the treasurer's account, and ascertain the amount of money in his hands. Heretofore there has been a lap between the years, and the purpose of this recommendation is to fix a time to which the treasurer for the current year will report, and hand over the money in his hands to the treasurer for the following year. The recommendation was then adopted.

On motion, the recommendation of the committee fixing the place for the next annual meeting at Philadelphia, was adopted. The recommendation of the committee, that the action of the Association yesterday in regard to printing the proceedings be reconsidered, was, on motion, adopted.

Mr. Denniston—The committee propose that, instead of the resolution adopted yesterday, it shall read as follows:

*Resolved*, "That the proceedings of the last meeting, and of the present meeting, be printed in a book similar to the last volume, and that the same committee have the printing done."

The resolution was adopted.

On motion, the recommendation of the committee, that Prof. Henry Morton be elected an honorary member of the Association, was adopted.

The Secretary, *pro. tem.*, Major Dresser, was authorized to cast a ballot for the Association.

The President appointed Mr. Neal as teller.

Major Dresser then proceeded to cast the ballot of the Association, and the teller reported that Prof. Henry Morton, Ph.D., was unanimously elected.

The President—I am happy to announce that Prof. Henry Morton has been unanimously elected an honorary member of this Association. (Applause.) As an additional inducement to members to pay up their annual dues, the committee recommend that the secretary be directed not to furnish copies gratuitously to any member who is in arrears for annual dues.

On motion, the recommendation was adopted.

On motion, of Mr. Harbison, the roll of the Association was then called, and the following members were found to be present:

Honorary Members.

Maj. G. Warren Dresser.
W. W. Greenough.

Active Members.

Chas. S. Allmand, Norfolk, Va.
Jno. Andrew, Chelsea, Mass.
H. A. Allyn, Cambridge, Mass.
Jno. Balmore, N. Y. city.
Isaac Battin, Albany, N. Y.
Wm. H. Bradley, Brooklyn, N. Y.
Geo. Buist, Halifax, N. S.
Wm. R. Beal, N. Y. city.
Jno. W. Bates, Hoboken, N. J.
T. A. Bates, Evansville, Ind.
E. Breese, Detroit, Mich.
Geo. D. Bill, Malden, Mass.
A. H. Barrett, Louisville, Ky.
Geo. D. Cabot, Lawrence, Mass.
Matt Cartwright, Buffalo, N. Y.
O. E. Cushing, Lowell, Mass.
H. F. Coggeshall, Fitchburg, Mass.
N. B. Crenshaw, Phila., Pa.
Henry Cartwright, Phila., Pa.
John Cartwright, Poughkeepsie, N. Y.
Jno. S. Chambers, Trenton, N. J.
Thos. C. Cornell, Yonkers, N. Y.
Wm. Cartwright, Oswego, N. Y.
W. H. Denniston, Pittsburgh, Pa.
Dorchester Gas-Light Co., Dorchester, Mass.
Geo. Dwight, Springfield, Mass.
F. J. Davis, Waltham, Mass.
M. N. Dial, Terre Haute, Ind.
H. H. Edgerton, Fort Wayne, Ind.
H. H. Fish, Utica, N. Y.
Wm. Farmer, N. Y. city.
F. W. Gates, Hamilton, Canada.
M. S. Greenough, Boston Mass.
L. P. Gerould, Newton, Mass.
Wm. G. Gardner, Pittsburgh, Pa.
Chas. A. Gerdenier, Bridgeport, Conn.
J. Pearson Gill, N. Y. city.
W. W. Goodwin, Phila., Pa.
H. F. Gerould, Cairo, Ill.
Jno. P. Harbison, Hartford, Conn.
L. C. Hanford, Norwalk, Conn.
A. Hickenlooper, Cincinnati, Ohio.
Jas. How, Brooklyn, N. Y.
Alex. E. Humphreys, Bergen Point, N. J.
Wm. Helme, Atlanta, Ga.
Jos. Hendly, Beloit, Wis.
I. Herzog, N. Y. city.
Thos. C. Hopper, Clarksville, Tenn.
M. Harrington, Niagara Falls, N. Y.
Edward Jones, South Boston, Mass.
T. Littlehales, Hamilton, Canada.
Edwin Ludlam, Brooklyn, N. Y.
P. Munzinger, Doylestown, Pa.
L. G. McCauley, West Chester, Pa.
Jno. McIlhenny, Phila., Pa.
Richard J. Monks, Boston, Mass.
C. F. Maurice, Sing Sing, N. Y.
Lewis Moss, Sandusky, Ohio.
W. H. Miller, Columbus, Ohio.
Geo. A. McIlhenny, Washington, D. C.
Hugh Murphy, Sing Sing, N. Y.
Jno. H. McElroy, Pittsburgh, Pa.
Geo. B. Neal, Charlestown, Mass.
Jno. W. Newell, New Brunswick, N. J.
Chas. H. Nettleton, Derby, Conn.
Chas. Nettleton, N. Y. city.
F. H. Odiorne, Boston, Mass.
T. J. Pishon, Roxbury, Mass.
Saml. Prichitt, Nashville, Tenn.
Albert D. Perry, Portsmouth, Va.
W. H. Pearson, Toronto, Canada.
W. H. Price, Cleveland, O.
Thos. F. Rowland, Brooklyn, N. Y.
Geo. K. Reed, Lancaster, Pa.
J. H. Rollins, Worcester, Mass.
Gen. Chas. Roome, N. Y. city.
Geo. Richardson, Wilmington, Del.
Jas. F. Rogers, Jamaica Plain, Mass.
A. B. Slater, Providence, R. I.
Marcus Smith, Wilkes Barre, Pa.
J. N. Stanley, Brooklyn, N. Y.
Jas. M. Starr, Richmond, Ind.
F. C. Sherman, New Haven, Conn.
Henry Stacey, Indianapolis, Ind.
O. G. Steele, Buffalo, N. Y.
Thos. B. Stephens, Tarrytown, N. Y.
Wm. A. Stedman, Newport, R. I.
C. F. Spaulding, Brookline, Mass.
F. A. Stacey, Cincinnati, O.
Dr. T. O'Connor Sloane, Brooklyn, N. Y.
Thos. Turner, Charleston, S. C.
R. C. Terry, Phila., Pa.
Chas. C. Van Benschotin, New Rochelle, N. Y.
C. White, Rochester, N. Y.
W. Henry White, Brooklyn, N. Y.
Gideon Wood, New Bedford, Mass.
Austin C. Wood, Syracuse, N. Y.
T. F. White, Houston, Texas.
Robt. Young, Alleghany City, Pa.
Oscar Zollikoffer, N. Y. city.

Mr. Littlehales—There was a paper read before the last meeting of the Association, on the price of gas. It was left over, to be discussed and considered at this meeting. When it was read it was supposed by some that there was something in it that might be considered a little objectionable, and that paper has not been taken up yet, I believe. I move, therefore, that it be entered upon the proceedings of the Association. I think it would be a great mistake to have the impression get abroad that any questions which are presented here, in the shape of papers, or otherwise, are not fully and fairly discussed. I

have read the paper over very carefully, and I cannot perceive that there is a single sentence in it that is objectionable, in any sense, or that there is a single expression in it that cannot be endorsed by every gentleman present.

Mr. Price—Every paper that is read must be entered on the minutes of the Association.

Mr. Littlehales—The paper was read; and a motion was made, and carried, that its consideration and discussion be deferred until the following meeting; and I, therefore, move a consideration of it now.

Mr. Helme—It seems to me to be very late in the day to bring that paper up now. It is a very lengthy paper, and there are a great many points in it which many members of the Association do not concur in; and, I have no doubt, hours will be spent in discussing it. I, therefore, move that it go over until the next meeting.

Mr. Harbison—I think that is rather an unfair way of meeting the question. There are many gentlemen present who, perhaps, have not heard the paper read; and, as its consideration was deferred until this meeting, I think we ought, in fairness and justice to its author, take it up now. Besides, we have just decided to print the proceedings of the last two meetings, one at Cincinnati, and the other here, and if this paper is not now taken up, it will not appear in the published proceedings, and it cannot be printed and distributed before another year. Even if there is not time to discuss it, there is no reason why it should not be read and printed, as other papers are. It has been the custom of this Association, from its organization, to discuss fairly the papers that are presented before it; but this paper has not been discussed at all. I think Mr. Patton's views are entitled to proper consideration and respect, whatever they may be. I do not think we ought to defer the consideration of it until another meeting.

Mr. Helme—I am under the impression that the paper was sent by Mr. Patton, and that he was not present at the meeting when it was presented. In justice to Mr. Patton, I think, its discussion should be deferred until he is present, so that he may have an opportunity of sustaining his views by argument. He is not here to-day, and I do not think it would be just to him to take it up in his absence. There is in the paper a vast amount of matter which many of us would take exception to, or, at least, there are many of us who would disagree with some of the positions he has taken. It would necessarily give rise to a long discussion; and I think that courtesy and fairness to Mr. Patton require that he should be present when such discussion is had, in order that he may reply to the criticisms and objections that may be urged against his paper; and, for that reason, I do not think we should take it up now. Of course I quite agree with Mr. Littlehales and Mr. Harbison that all the papers which are presented before this Association should be fairly discussed, but not in the absence of their authors, especially if they are likely to give rise to a long debate and the expression of adverse criticism. That is my principal reason for objecting to the paper being brought up now. Besides that, we are to close our session at 12 o'clock to-day; and as there are matters yet to come before us, that require our attention, it would be impossible, even if the paper were brought up, to discuss it fully and satisfactorily.

Mr. Harbison—We are here for three days, and while I do not wish, as far as I am concerned, to prolong the session one hour more than is necessary, I do not know that there is any obligation resting upon us to adjourn at twelve o'clock to-day *sine die* by any means. Mr. Patton asserts his position in his paper, and gives his reasons for the opinions he expresses; and I think the paper ought to be received and printed. We do not express our assent to the views presented by any member of this Association, because the paper in which he expresses them is printed. We may not agree with a single proposition he advances; but that is not a reason why his views ought not to be properly treated. If he thought there were points in his paper which might be assailed, and deemed it necessary to defend his position, he might have been here to do so. But the fact that he is not is no reason why his paper should not be treated in the same manner that other papers are treated, particularly as he has not requested that its discussion be deferred until he can be present. If he had thought that his presence was necessary, he would, in all probability, have sent a request that the consideration of it should be postponed until he was here in person.

A member—I think it would be very unfair to take up this gentleman's paper, and discuss it, in his absence. I think it would receive a great deal more consideration, and be far more satisfactorily and fairly discussed, if he were present, and had an opportunity to reply to whatever might be said against it; hence, I think it only just and courteous to him that the paper should lie, as it does now, on the President's table until he is here to join in any debate that may be had upon its merits.

The President—The motion before the Association is that the discussion of this paper be postponed until the next annual meeting.

Mr. C. White—While I quite agree with Mr. Littlehales and Mr. Harbison that this paper, like every other paper, should be properly and fairly treated by this Association, I think it is too late in the session to enter into the discussion of it now. Besides, I do not think it would be fair or just to Mr. Patton's views to take up the paper in his absence. I, therefore, move as a substitute for the motion made by Mr. Helme, that the paper lie on the table until Mr. Patton is present.

Mr. Helme—I accept that amendment. I will take the liberty of saying that, unless I am very much mistaken, there was a resolution passed yesterday that we should adjourn *sine die* at 12 o'clock.

Mr. Littlehales—If papers are to be treated in this way, and if they are not to be read, or considered, except the writers are present, the result will be that papers presented by gentlemen living at a distance will simply be laid upon the table and ignored. I think there is some misapprehension about the contents of that paper. I have read it carefully, and I do not think there is a statement in it that any member of this Association can reasonably object to; and I cannot see why it should be treated in the manner proposed. I sincerely hope that this Association, which has heretofore treated all papers presented to it in a fair and candid way, will not now, for the first time, make an exception to the rule it has heretofore uniformly adhered to. I greatly fear that such action will result eventually to our disadvantage, if not to our discredit.

The President—Mr. Helme having accepted the amendment proposed by Mr. White, the question now before the Association is, shall the consideration of this paper be postponed until the author shall be present in person? Carried.

Maj. Dresser—I have received a letter which, with the permission of the Association, I shall read, inasmuch as it relates to the business of the meeting.

While in Paris, Mr. Forstall, of New Orleans, promised to prepare a paper upon the Paris gasworks, to be read at this meeting. He fully expected to do so when he left; but I received this letter from him a few days since. I read it in justice to Mr. Forstall to show why the paper was not presented. [The letter was read.]

Mr. Harbison—I move that the secretary be instructed to return Mr. Patton his paper with the action of the Association in regard to it. If he wishes to present the paper again to the Association he can do so.

A member—The paper is laid upon the table; and that motion cannot now be made.

Mr. Harbison—I am not aware of any action of the Association by which the paper was laid upon the table.

The President—The paper was not laid upon the table; but the discussion of it was postponed until Mr. Patton could be present. The paper cannot now be discussed; but the motion has been made that the paper be returned to the author, together with the action of the Association in regard to it.

A member—I move that motion be laid on the table.

The President—A motion has now been made to lay motion of Mr. Harbison upon the table. I presume the motion of Mr. Harbison is intended as a respectful act on the part of the Association toward Mr. Patton, that he may have an opportunity of reviewing his position, if he pleases.

The motion to lay the motion of Mr. Harbison upon the table was carried.

Maj. Dresser—On the subject of the next annual meeting, I would like to make a suggestion, and offer a resolution. It is usual, when the Association holds its meetings in New York, to appoint a committee to take the matter in charge, and make the necessary preparations for a hall, etc. Inasmuch as the Association has decided to hold the next annual meeting at Philadelphia, I move that Mr. Thos. R. Brown, Engineer of the Philadelphia gas works, Mr. Henry Cartwright, Mr. Helme and Mr. W. W. Goodwin, who also live in Philadelphia, be appointed a committee to make the necessary preparations in Philadelphia for the meeting next year. Adopted.

Mr. Neal—We listened to a very interesting lecture upon the subject of "Electric Light" last evening, and there may be some members of the Association who desire to say something on the subject. It is a matter that is deeply interesting to us at this time, and I think we might spend a short time in discussing whatever may have been suggested by the lecture of Professor Morton. We might very profitably have a little interchange of opinion on the subject. The public are very deeply interested, and want to know all that can be learned about it. Every day the question is asked—"What do you think of it?" Personally, I reply, that I know very little about it; but I think that perhaps we might spend half an hour, or so, very profitably in talking over the matter.

The President—We are ready to hear the expression of any views that may have presented themselves to the members of the Association growing out of the lecture of Professor Morton.

Mr. Neal—I hope we shall hear the views of some of the members on the subject of electric light. It is a very grave subject, and one that perhaps some of us are afraid to handle. Still, there are some of the members who have had interviews with gentleman who are connected with

the manufacture of engines for producing the electric light, and they may be able to give us some information; and while I am up I will ask Mr. Helme, if a firm in Philadelphia has not tried electric light, and made experiments with it in their workshops, and whether they have found it practicable?

Mr. Helme—I don't know that I can say much on the subject. We heard from Prof. Morton last night that the production of electric light was not a new thing, and it is known that it could be done twenty years ago, as he said; but, at that time, the cost of producing electricity precluded the possibility of its introduction as a means of illumination. Since then machines have been invented that produce electricity at a very much less cost; and the question now arises, can electric light be produced, by means of these machines, at such a cost, and be so diffused, that it will take the place of gas. For my own part, I have very little apprehension in regard to it, except in the way that Prof. Morton suggested last night, viz., the illumination of public buildings and parks, and, perhaps, large hotels. Admitting that it does come into use that far, the question then arises—how much would the gas companies suffer from that. So far as my experience goes, I have made very little money from the lighting of streets or public parks, and I may say that I have made very little out of hotels, because hotels being among our largest consumers, and being hardly able to afford gas, always seek to get it at the lowest figure, and there is more or less difficulty in collecting the bills.

Now, there are several of these electric machines, as we all know. As the defects of one machine have been demonstrated by experiment, others have been invented, and are being invented. The attention of scientific men and inventors has been turned, within recent years, in this direction: and scientific attainment and mechanical ingenuity and skill are constantly at work, in this country and in Europe, in the attempt to solve the problems that are presented in the way of a perfect utilization of the electric light. The Franklin Institute, I believe, has bought a machine, and has appropriated $500 for experiments. The different makers were invited to send one of their machines for trial. These various machines were tried there at the Institute, and experiments made with them. Finally, a Wallace machine was selected, and it did very well, except that the ceiling was not high enough to get a proper elevation for the light. They lit several burners in the hall and in the library, and kept them for some weeks. There was no attempt at following it up, as Prof. Morton did. It was all right in many respects, and for certain purposes. The first thing I knew, it came out that they were going to light the passenger sheds of the Pennsylvania Railroad Company, at West Philadelphia. Gen. Corliss, who happened to be the attorney of the inventor, said he would like to have me go over and look at it, and I said I would do so. I went over, and found that they had put four lights in the shed, two on each side. The engine was down about twenty feet below the shed, and about forty feet away from the edge of the shed. The engine was of ten-horse power, and was worked up to its fullest capacity. They labored faithfully, but after running a little while with the four lights we could scarcely see across the shed. Then they shut them off for two hours, but they did not work at all satisfactorily, and they gave as a reason for it that the machine was too far away from the lights. I do not think the machine was over 60 or 70 feet from the lights. I would mention that in the Franklin Institute they had the machine in the cellar, and the nearest light was not, probably, over 20 feet from the machine, and the other one about 20 feet more, and therefore I suppose that was the reason why it worked so much better in the Institute than in the railroad shed. They went on, and tried night after night, for about a week, to light the passenger shed of the Pennsylvania Railroad. Finally a notice appeared in the paper which read to this effect:—that a certain officer having charge of the depot had been authorized by the board to take charge of the whole matter, and nothing has been heard from it since.

For my own part, I do not feel any apprehensions that the light will interfere seriously with the consumption of gas. Even if the light can be diffused through the entire building, it becomes too strong to be pleasant. Now, in regard to putting in some of these lights in works at West Philadelphia, I would say that I called at the office of the works where they were introduced, and made inquiries there, but did not get much information one way or the other. Finally, I was informed by the person from whom I made the inquiry that they had had the light in there, but that it had not operated satisfactorily, and they had taken it out of all the rooms but one, and that was the folding room. I think we all know that that does not require a very brilliant light. They said they had tried it in their other rooms; but they had met with one difficulty, and that was that they could not get it high enough—that the ceilings were not high enough to admit of a proper elevation of the light. Another objection they had to it was this, that the shadow was so intense that operators frequently mistook the shadow for the thread; the consequence was they did not care to be bothered with it. A great deal has been said about putting it in other places, but I think that is about all that has been done, or is being done, in Philadelphia; but perhaps Mr. Cartwright knows more about it than I do.

Mr. Harbison—I would like to inquire of Mr. Helme why he does not wish to have street lamps as part of his consumption?

Mr. Helme—It is a little late in the session to give my reasons in full for the opinion I have expressed upon that point. I have had considerable experience in the matter of furnishing street lamps with gas, and the result of my experience has been that I have made very little money out of it. That remark was made quite incidentally, in speaking about electric light, and as that is the subject which we are now exclusively discussing, I do not propose to go into a discussion of the other question, or give my reasons in detail for the statement I have made.

Mr. Harbison—I would also like to inquire why Mr. Helme does not regard hotels as desirable consumers. I suppose he can have no objections to stating the reasons for the views he has expressed.

Mr. Helme—As I said before, it is too late in the session now to enter into a discussion of that question. That has been my experience, yet I do not mean to say, of course, that that is the experience of all gas makers. My experience has been that you must furnish the gas at low figures, and wait a long time for your bills, and sometimes not get them at all.

Mr. Price (in the Chair)—It is not intended that any subject but the electric light shall be discussed at present, I suppose, and therefore I think the members had better confine themselves to it. I do not suppose that the question of furnishing gas to hotels is a proper one for discussion at the present time.

Mr. Harbison—I think that my question is a proper one, in view of what Mr. Helme has said, and I hardly think he is justified in declining an answer. If there are any reasons known why the public lamps are not profitable consumers, I think the gas companies ought to know it. If there is any valid reason why hotel keepers are not profit able consumers, I think we ought to know that. Hotel proprietors are generally regarded as the largest and best paying consumers.

Mr. Helme—I said, as a general thing, my experience was that I had made very little money from street lamps and hotel proprictors.

Mr. Price—I do not think I can allow you to go on with the discussion of this question, as I think it is generally understood that the discussion is to be confined to the subject of electric light. However, unless there is a motion made to that effect, I do not know that I am authorized in making this ruling.

A Member—I move that the discussion be limited exclusively to the subject of electric light. Carried.

Mr. Helme—I find that there is a great difference of opinion among scientists in this matter. Prof. Morton surprised me by some of the statements that he made in his lecture last evening, because, in talking with a gentleman whose profession is the same as that of Prof. Morton, he stated that he believed that all Mr. Edison had done, or that it was claimed by his friends he had done, was possible. He is enthusiastic on the subject. He is a firm believer in the future possibilities of electric light. There is, as I said before, a great difference of opinion among scientific gentlemen of equal ability npon this question, and where these learned savants disagree it is hardly to be expected that we should be able to arrive at the truth.

Mr. Cartwright—As a gas stockholder I have been connected with gas companies for some years. I have watched the progress of electric light with an interest solely my own. Mr. Helme speaks of experiments made at the Franklin Institute in that direction, and of the results of experiments in the railway shed at Philadelphia, and some other places; but he seems to forget that we have one other instance. I name the Exposition Building, which he probably has not visited since 1876. As the result of observations which I made, I would state that the building has been lighted two evenings a week, for some weeks, by six Brush machines, which supplied twenty-two burners situated in the central part of the main hall, which you probably all remember. They are driven from the main machine by a shaft. The operation is carried on by means of the engine provided for running the machinery of the Exposition, or, as it is now called, the Permanent Exhibition. They are run at a velocity of about 800 per minute, and when I saw them they appeared to be unsatisfactory in their results. They were heated a good deal; but the attendant told me they would get about so hot, and would not get any hotter. I suggested to him whether the effect upon the lights would not be more satisfactory if the velocity of the machine was increased. He said it certainly would; but that they were afraid to increase the speed because of the effect of the heat on the machines, and, therefore, they had to confine the velocity to about 800 per minute. The lights are scattered over what is termed the nave of the building, which is the portion at present appropriated for concerts and balls. I think on every Wednesday night they have a ball, and on every Saturday

night they have a concert. The lights are scattered in both directions, and are situated pretty high up. I understand the gas is all extinguished. The shadows are very dense. The practical result of these lights was, in my judgment, not a success. I will not say it was an entire failure; but I will say this, that if, as a gas-man, I should be called upon to light an area of the same size with gas, and gave no better light than is produced by these electric machines, it would be voted a failure. Of course, being a new thing, everybody is interested, and people are very lenient in their judgments and criticisms concerning it.

The effect upon the eyes is certainly very trying. Then there is an unpleasant effect produced by the rising and the falling of the light. Sometimes you can read your programme, and othér times you cannot do so for a few seconds. Consequently, I consider the result as not a success. Then the effect upon the audience is objectionable. It gives to everybody a ghostly appearance that is not pleasant, especially in a scene of enjoyment. It changes the hues and the colors of the ladies dresses, and, more particularly, the color of their faces. My observations being of a general nature, and directed more especially to general results, I express these views for the sake of informing the Association of how far success has been accomplished. Mr. Helme has spoken of one or two other points in Philadelphia where the light is used. There is still another. I do not wish to take the wind out of his sails, as he has some information in regard to it, in connection with myself, in an investigation made on this subject by Mr. Bartol, President of the Washington Company, and several other gentlemen who were similarly interested in the subject. Mr. Bartol, knowing that it had been employed in the works of Messrs. Cranch, iron ship builders at Philadelphia, wrote a letter to them inquiring about it, and he received a letter in reply, from their general superintendent, Mr. Wilson, who is a mechanical engineer of considerable reputation, and a gentleman of large judgment, as everybody who knows him can testify. In what I am going to state I can only speak from information received through others. This firm of ship builders have a large building where they set up the machinery for their steamers and work upon it, and they have tried the electric light in that building. I understand that it was employed in the place of gas, which they had always used before. This little disturbance between Russia and Turkey has thrown a good deal of work into their hands, and they have been obliged to run their works during the night. They were induced to put in an electric light into their shop, and after using it for some time, I don't know exactly how long, it proved unsatisfactory, as I was informed through a letter receiv- from Mr. Wilson, their superintendent, and its use was discontinued.

Now, from what I have seen and heard of these instances in Philadelphia, and from the observations I have made, and from what I have been told in connection with the experiments that were made at the Franklin Institute, I have looked upon the subject as one *not* very dangerous to the interests of gas companies. As Prof. Morton said last evening, I suppose there are some particular kinds of work for which it may be made available. I take some exceptions to all that has been said and published in regard to its adaptability for street lamps, for the reason that it takes so much power to produce and supply the light that, even were it capable of being divided, its expense would be so great that, in my judgment, could not be made available for that purpose. On the general subject I have nothing further to say. I have simply given the Association the results of my observations and my information in regard to what has been done in Philadelphia.

Maj. Dresser—I would like to say a single word in reference to the heating of the machine. There was a series of experiments conducted in London, and a Siemens machine was put up for the purpose of trying the experiment. The same trouble that Mr. Cartwright has spoken of, in regard to the heating of the machine, presented itself there. Mr. Siemens, the inventor of the machine was asked in regard to that, and he made this remark; that the machine would, of course, be hot, but that it was perfectly safe to run so long as you could hold your hand on it. When it got so hot you could not hold you hand on it, you had better let up on it. (Laughter.)

Mr. Nettleton—I believe several of the gentlemen who went over to the lecture last night, met Mr. Wallace, and to more than one he made the remark that he considered this a good time to buy gas stocks; and said, turning to me, "you know, I am doing that." Mr. Wallace, as you all know, is probably more deeply interested in the success of this light than any other man in the United States; and when he says that, it seems to me, we need have very little fear of our future prospects.

Mr. Helme—I think Mr. Price may be able to give us some information on this subject, inasmuch as the Brush machine is made in his town.

Mr. Price—I do not know that I can throw very much light on this question, but I will tell my experience. I was invited one evening to be present at the shops of the Lake Shore Railroad Company, to witness some experiments with the electric light that were going to be made there. The lights could not be elevated sufficiently, and the results were not satifactory, so far as my judgment was concerned, and I don't think it was regarded by anybody but the newspaper reporters as a success. There were exhibitions of the light at some works in our town, but I was not present at either of them; but I am informed that they were not a very great success. It had been proclaimed in the newspapers, however, as a great success. It was exhibited afterward to some persons by special request. The next morning I went up to the works to make some inquiries about it, and I met the president coming out. I knew the gentleman, and tried to talk with him in regard to the electric light. He said, "I don't know much about it, but if you will see our superintendent about it, he can give you the facts," and drove off. I staid there and had an interview with the superintendent, whose name I cannot now remember; but he was a very pleasant and intelligent gentleman, with whom I was acquainted personally, and I found him at his works, and he and the secretary took me to their private office, and we had a long conversation over the recent exhibition. The superintendent said, and the secretary coincided with him, that it had been demonstrated by experience that in building factories it was not desirable to make the stories more than twelve feet high. That was found to be the most convenient for the elevation of their shaft, and most convenient for the heating of their building. Experience has shown that that is about the right height, but it is two low for the electric light to be used to advantage, and the light was not a success there. He said that the stories of factories would have to be built higher, and therefore involve greater cost of construction, as building in that way would violate some of the plain rules of economy in the construction of buildings of that character. I went to see the president of a rolling mill there He is largely interested in the rolling of railroad bars, etc., and he said substantially the same thing. He said that the light would have to be elevated, and that would render additional height necessary; and as these changes would have to be made in factories that were already built, before the electric light could be used to advantage he did not, for that reason, think the light would be very much used.

I am personally acquainted with Mr. Brush. He graduated at our high school, and when I was president of the board of education in our town, I gave him his diploma. I regard him as a very promising young man. He is, perhaps, about thirty years of age, and a good electrician in this department. He is enthusiastic in his work, and I think he believes he has produced the best machine that has yet been devised. He told me that the judgment of a jury of experts had been passed upon his machine, and that it had been pronounced the best machine for producing the light. He told me at the same time he had no expectation that it will affect materially the consumption of gas. He has no idea that it can be so divided that it can be introduced into private houses. and do away with the consumption of gas. He thinks it can be used substantially for the purposes mentioned by Prof. Morton last night, but not for lighting private dwellings, or for the many other purposes for which gas is used.

In regard to its success in this respect, there is a singular contradiction of testimony. The ladies of our town are going to have a loan exhibition for charitable purposes, and, naturally enough, perhaps, they have made me chairman of the committee for lighting fhe building. It is an old school building, which has been superseded by a better one. It became a practical question as to how we should light the building. It was suggested that it should be lighted by electricity. So much had been said upon the matter in the papers, that it was thought it would be an additional attraction. I said to the ladies, "do just as you like. If you prefer electricity to gas, I will try to have electricity. I prefer gas, and I will endeavor to give you a very good quality. We don't care to light your building, for you will probably expect me to give all my attention to it, and all we can make out of it." I told them that there would be a good deal of trouble in lighting the building by electricity, and that we could not guarantee the result. The ladies pretty unanimously said that, as the matter was unsettled, and as there is a possibility of failure if we tried electricity, therefore we had better use gas. And arrangements are being made for lighting it with gas.

Now, while I was discussing this matter, and investigating it, I was informed that the illumination of a building in Philadelphia was a perfect success. I was assured it was so, and I think the person wo told me believed it. Mr. Brush also, in substance, told me the same thing. I think he also told me that the illumination of the Mechanics' Fair, at Boston, was a perfect success so far as the Brush machine was concerned, but that so far as the Wallace machine was concerned it was a failure. [Laughter.]

Now I think, as gas men, it is our duty to view this matter in a calm and impartial light. I do not think we should become prejudiced, and listen to all the testimony that favors our view of the questson, and reject all the testimony that seems to be unfavorable to it. As gas men, I think we are naturally inclined to disbelieve the testimony that is favorable to electric light, be-

cause, we judge, it may interfere with our business. I think we should seek to rise beyond our prejudices, and be entirely fair in our judgments, and be ready to meet the question in its various phases as they are presented to us. If Mr. Edison, or any other man, can succeed in dividing the electrict light into 1,000, or 10,000, or 100,000 different lights, and give, at the same time, a clear and satisfactory light, our vocation is gone; that is, if it can be made as cheaply. Of course, that is one of the principal points. If he cannot do it, of course the light will not supersede gas. I do not apprehend the slightest danger myself—or no essential danger, at least—judging from what has been done. There has been a great deal said, through the press and otherwise, about what Mr. Edison has done or is going to do. I find there is a gaeat difference of opinion aboat it There are a great many people who are inclined to think Mr. Edison is a great genius—that he is abundantly able to accomplish all he has promised. I find, however, that scientific men who have given the subject a great deal of time and thought, have not so much confidence in his ability to accomplish all that he says he is able to do.

I think we are just in the position where we have nothing to do just now. We shall see pretty soon, in all probability, what can be done. For my own part, I do not feel disturbed about the prospects. I think gas stocks are still good enough, and I think it will be a long time before they are interfered with seriously by electric light.

Mr. Neal—I hold in my hand a paper entitled the New York *Herald*, dated Friday, Oct. 18, 1878. Mr. Harbison objects to my reading from the paper, because it has not been approved and recommended to be read by the Executive Committee; but such action is not necessary in the case of the New York *Herald*, for its statements are always correct. [Laughter.] No one ever knew it to be mistaken, and consequently I feel entirely justified in reading from it. Its reputation for always telling the truth, and always making statements that are perfectly accurate, is so notorious and widespread that I am sure no gentleman present will for a moment think of questioning the truth and accuracy of what I am about to read.

Now, the gentleman last up said that we were not to be guided by our prejudices in this matter, but that we were to listen to the testimony upon both sides of the question. It seems as if, in the course of their remarks, those who have spoken upon the subject have given testimony somewhat against the practicability of the electric light, and it is pleasant to know that there are some gentlemen here who believe in it, and I have no doubt we should all be very glad to hear from the gentlemen who hold favorable views on that subject. Let us hear what the New York *Herald* says: "Mr. Munzinger, of Philadelphia, said that the electric light was sure to be generally adopted, some day or other." Let us have something on that side of the q iestion. Of course, everything that is in the New York *Herald* is true.

Mr. Munzinger—I shall have something to say about that report in the New York *Herald* by any by. While we are upon the subject of electric light, I will say that I have made many experiments in connection with it. My first experiments were with 50 cells and an inch copper wire, at a distance of about 300 feet from the battery. I made many attempts to separate the light, but I was not able to do it. I have made a great many experiments with the Gramme machine, and also made experiments at the centennial building, in 1875. We had a Wallace machine, and I think we also had a Brush machine. We had lights placed on the memorial building. It reqnired an engine of about ten-horse power, I think, to produce the light. The light was by no means a satisfactory one. Then we also made later experiments, but we could not get any points that would burn well. We also had lights at the Pennsylvania Railroad Depot, but they were very unsatisfactory. I also made inquiries at Crauch's shipyards, where they had had a machine for producing the light, but I found that they had removed it.

Now, as to the report in the New York *Herald*, I have simply to say that a young man, whom I suppose now to be a reporter, stood outside of the doors, and wanted to know what I thought of the electric light. I told him there was nothing impossible in this world, apparently, in the way of invention, since you can now stand at one end of the world and talk to a person at the other; but I told him there was no possibility of the electric light coming into general use. But he has distorted my views, as you see there. The pretended report of what I said is entirely incorrect.

Mr. Neal—It must be so, because it says so in the New York *Herald*.

Mr. Munzinger—The New York *Herald*, for once, is mistaken. My views are not all correctly expressed. It is a misrepresentation of what I said.

Mr. Neal—I should like to ask Mr. Price if he really thinks that if this electric light should prove to be successful our avocation is gone? I do not consider it so. We are organized for the purpose of furnishing artificial light to the public. A stockholder of the company I represent wrote me a note the other day, in which he said, among other things, that it would be a good plan, at the next meeting of the Legislature, for the Charlestown company to petition for a change in its name, and that it read as follows: "The Charlestown Gas and Electric Light Company." Now, if the wildest aspirations of Mr. Edison are realized. why cannot we go into the business of producing light by erectricity, in connection with making gas? Nobody believes, not even Mr. Edison, I think, that gas will be entirely superseded, because, as I understand it, in order to furnish the light, a machine must be run constantly. The moment the machine stops the light goes out. but gas, as we all know, can be stored. Now, if it is a perfect success, it may supersede gas in many respects, such as the lighting of large buildings, and, possibly, the streets, but it cannot do away with gas entirely. Even if it be a perfect success, why cannot those whose business it is to furnish light to the public, furnish electric light as well as gas light. I do not think that the owners of these patents will go up and down the street, and stop at each house and ask the proprietor to use the electric light, but they will go to these large gas companies—these monopolies, as they are called—and they will make arrangements with them, and if we have the right to sell it and distribute it to the public, in connection with the manufacture of gas, I see no reason why it should not be made profitable. If it costs five cents to manufacture it, and we pay a royalty of forty-five cents, and charge our consumers a dollar, we will be making a very handsome profit.

Mr. Price—I did not mean to be so understood. We have all heard the extraordinary statements that have been made in regard to what Mr. Edison has done, or can do; and what I meant to say was this, that if all these statements were true in their length and breadth, if the electric light could be produced as cheaply, and carried into private houses in the same manner as gas, and if all the other wonderful things can be done that Mr. Edison is represented as being able to do, then our business as gas men is gone, and our capital would be largely affected. It is true, as Mr. Neal suggests, that, if the electric light could be carried into houses, etc., as has been claimed, then the gas companies might change their business, and manufacture electric light in place of gas. The business might be carried on in that way; but it is easy to believe that many difficulties might arise. I think these claims that have been put forth are grossly exaggerated. I do not believe that Mr. Edison set up all these claims, and I do not believe that those who make them are authorized to do so by him. You are aware, gentlemen, of the efforts that have been made for a long time to find something that will illuminate in the place of gas; and the whole scientific world has recently been giving its attention to this question of electric light, and having the whole scientific world at work, trying to accomplish it, it is impossible for us to tell what may be done. But these claims that have been put forth on behalf of Mr. Edison are contrary to all experience thus far. I think the great weight of testimony, on the part of scientific men and learned bodies, is against any likelihood of all these things being accomplished. When I said that our vocation would be gone, I referred to the accomplishment of all these statements that we have seen made in the papers.

Mr. Neal—While these anticipated improvements in electric light are spoken of, is it not as probable that progress will be made in the manufacture and distribution of gas, so that it can be furnished cheaper and its illuminating power be increased?

Mr. Price—There are a great many interesting questions that arise out of the discussion of this subject, and I would be glad if they could be pursued and investigated. I was in the chair when Mr. McIlhenny read his paper upon the organization and the government of gas companies, and did not have an opportunity to make suggestions that I would otherwise have been glad to make. There were a good many interesting questions that arose naturally from the reading of that paper, and I wanted to hear discussion upon the importance of so improving the manufacture of gas, that we could sell it in competition with everything else but sunlight. I wanted very much to come down upon the floor and talk these matters over. Take for instance a subject suggested by Mr. McIlhenny's paper, viz., the economical management of gas works. I think this has been very much overlooked in times past. Gas companies, in many instances, have been very reckless in their management. While they have made good profits, and paid large dividends, the details have not been very closely looked after or inquired into. I think it is of the highest importance in our business that the gas works should be economically and carefully managed, as much so as if they were a private business conducted by one or two individuals for their own profit. If that is done I think we shall be taking one great step at least towards securing cheaper gas.

There are many other interesting questions that we might properly discuss; but it is too late now to give them attention. The whole question of how we can manufacture gas cheaper is one which, at the present time, I think, deserves our most careful attention. I think we ought to give more attention to some of these details, when

we come together, for the purpose of improving ourselves in the manufacture and distribution of gas. So far as I am personally concerned, I have enjoyed this meeting very much, and it certainly has been a success in all respects, except, perhaps, the one I have just indicated. It seems to me that a discussion of these practical details is what will be of most service to us; for instance, the best kind of coal to use, the best kind of retorts, the best arrangement for fuel, and, in fact, the whole details of the management of the works.

Mr. Coggshall—Before we adjourn I wish to say that I think Mr. Price has struck the key note in regard to what is most profitable to discuss at these meetings; and I hope that the executive committee will have some paper or papers prepared upon the subject of making gas at the lowest rate. I think we should have one or more papers prepared on the economy of making gas, and upon the utilization of our residual products, so that we can receive a larger compensation for them. I have no fears about the electric light at present, and I think we can profitably turn our attention to the subject of manufacturing gas at a less rate.

Mr. Neal—As the hour fixed for the close of the session has passed, I move that we now adjourn.

The President—Gentlemen; I have listened with all the attention I could give to the matters which have been discussed at this present annual session, and I have listened with the same attention to the papers which have been read before you. These discussions are not regular and formal orations, but are more in the nature of conversations where one gentleman gives his own experience, and then asks the experience of others, and answers questions which may be proposed. All this discussion, all these questions and these answers tend to attain the object which has been spoken of to-day, viz., how best we can conduct our business, and how we can produce the most acceptable light at the least possible rate.

In the years gone by we have had discussions over and over again as to the best method of setting retorts, and the best method of purifying and condensing gas. These are subjects which are constantly presented to us, in the paper which is now the official organ of this Association, the AMERICAN GAS-LIGHT JOURNAL, published in this city, one of the most valuable scientific papers of the day, and edited with consummate ability. [Applause.]

Some jesting has been indulged in to-day in connection with the *New York Herald*. The *New York Herald* is accustomed to crack its joke, even at the expense of truth, and even though honest and worthy men may suffer. [Applause.] Other papers have seemed to take pleasure in speaking in a manner particularly harsh of plumbers, gas-fitters, and other honest mechanics just as though a mechanic must necessarily be as devoid of principle as a newspaper. [Applause.]

Now, gentlemen, you have heard much, in your conversations together, informally, at your boarding-houses and hotels, which will be of service to you, I doubt not. Carry the lessons you have learned home with you, and use them in your profession wisely and honestly; for if there ever was an honest profession on God's earth, it is the profession in which we are engaggd; and if there is any article in the market known to commercial men which is sold with more accuracy and exactness than the product we manufacture, I do not know what it is. It is a very common thing for the editors of newspapers to throw dirt at gas companies and gas managers. They even go so far as to say that consumers pay just what we please to charge, without reference to the amout of gas consumed; that no one knows whether the meters we use are honest or not; and that we say to the consumer, "You must pay for what the instrument shows you have used, or we will deprive you of the gas." Where do we buy our meters? We buy them of honest mechanics, and besides that, no meter can be put in use that is not tested by a public officer, appointed by the Governor, under authority of law. We have no control over that matter. We are compelled, under penalty, to use an article which the law says we shall use, and if there is anything in our business, as men and engineers, that we ought to understand, it is the construction of a meter which we are compelled to use, whether we want to or not.

Gentlemen, it is a slander upon us when the papers come out and represent us as dishonest. It is a slander upon us when they call us monopolies. Why, in this very district where this meeting is being held, there are three competing gas companies. Where is the monopoly, then? Surely not here.

We know that we are entitled to receive the respect and confidence of the public at large. We know that our business is conducted in an honest and impartial manner. The manufacture of gas is reduced to a question of pure science. Learned chemists and skillful engineers have devoted years of patient study and toil to the solution of the various problems that have presented themselves in the development of the science. Are their reputations to be assailed and their good names tarnished by every penny-a-liner or would be wit? Any man can throw mud. No character is so safe that it cannot be stained by the malice or the ignorance or the bad feeling of those who do not know what they are talking about. [Applause.]

We are about to separate. We are going to our homes from the Canadian to the Mexican lines, and from the Atlantic to the Pacific oceans. Let us maintain the dignity of our profession, and resent any insult cast upon our integrity. [Applause.]

I wish you, brethren, a pleasant journey home. I sincerely hope it may be my good fortune to meet you another year, and that the year upon which we have just entered will witness constant improvements in our business. We have no secrets from each other. Our works are open to all—not only to those who are engaged in the business, but to the public at large. We have no secrets that any honest man would wish to guard.

I bid you respectfully and affectionately farewell, and declare this annual meeting of the Association adjourned *sine die*. [Applause.]

---

**Explosions.**—A violent explosion has occured at the Livesey Cotton Mills, Blackburn, belonging to Messrs. Dugdale, caused by a man named Lowe going into a room which there was an escape of gas with a lighted candle. Lowe and two other men were severely injured. The damage done is estimated at £1000. On Monday a boiler explosion took place at the brick works of Mr. Warne, Stoke-on-Trent, seriously injuring four men. The front part of the boiler was blown across a canal, while the main part went in an opposite direction, knocking down the chimney stack and engine house, and sending most of the machinery down a marl hole, where several men had a narrow escape. The cause of the explosion is not known. The boiler had been in use for 38 years.—*Ironmonger.*

[From "Journal of Gas Lighting."]

## The Electric Light and Lighting by Electricity.

BY J. O. N. RUTTER.

PART II.

To describe as I have done, very briefly, the phenomena of electricity, and how electric light is obtained, has not been difficult. To attempt an intelligible summary of the various plans hitherto adopted to give practical and useful effect to the light is a different affair. Nor would that alone be sufficient. It is not so much what has been done, and is now doing, about which anxiety and expectation prevail, but rather what is likely, and what is in preparation, to be done. What is earnestly desired is some revelation which will make plain and show in actual practice, night by night, without interruptions or failures, how the light can be supplied so as to be commercially beneficial and financially profitable.

Hitherto the progress of lighting by electricity has been more like a rapid succession of experiments than such illustrations of the capabilities of the light as to offer reliable means for estimating its relotive value as a light-giving agent. No one has a right to complain of this. It is precisely that which has to be expected. Experiment must precede practice, and the best arranged experiments generally require to be adjusted and re-adjusted many times, and extending over long periods of time. The promises are so numerous that, if only a portion of them prove to be realities, they will contain exactly what is needed.

It would be worse than presumption, as well as out of place, to express any opinion as to what will and what will not be done. But it seems not within the limits of propability that, with so many minds and hands at work, there will not by and by be accomplished, it may be with what is now known but concealed, or unknown and yet to be discovered, an unveiling of conditions and methods which are now wrapped up in mystery. This and a great deal more is waiting for us, it may be in the immediate or remote future. Let us try to exercise patience. Electricians and mechanicians are hard at work. They must not be hurried.

What are the special properties and qualities of the electric light? It is not like sun light—that is, the sun light supplied to our world. What that might be far away beyond the boundaries of the atmosphere, and undimmed by its tempering influences, is not known. But sun light and electric light only resemble each other in effulgency, not in essential light-producing qualities.

In the solar spectrum, if the exact proportions of the prismatic colors be not known, there is no difficulty in showing that they differ from those in the electric. The latter has a greater proportion of blue and, probably, smaller proportions of yellow, orange, and violet. Of this more will be known hereafter.

It is well for gas light that it can stand any amount of abuse. I suppose there are some people who were born grumbling, and never leave it off. By such it is sometimes discovered that the gas lights are tinted with yellow. Good for them and for all consumers of gas that there is a little yellow in the light. It is that which makes it agreeable, and which is a preservative to eyesight. It is now said, with a great to-do about it, that the electric is a purely white light. But it is not, for it has an excessive tint of blue in it, and so has to be attempered. Must this be done by mixing with it some yellow rays?

Looking about for a suitable description of electric light, not as it is represented or misrepresented, but as far as our knowledge of it extends as it is, I know of no name more appropriate than Compressed Lightning. Be it so or not has nothing to do with its applicability to lighting purposes. What may be its actual position as an agent for diffusing artificial light—no, not artificial, for, in the fullest sense, it is natural—time only will make known. Then, as to its divisibility, there will be a limit, because experience has hitherto shown that dividing the electrical current is accompanied by loss of power (electrical force). Nor is it to be admitted, what has been so often repeated, that the intensity (fierceness) of the light is unmanageable unless one-half be obscured. If, in roughly-conducted experiments, for merely showing the power of the light and the areas it would cover, that has been so, let it pass. But in its scientific and commercial aspects, to talk about throwing away one-half of what is so beautiful before the other half can be utilized, is not credible.

What is known and has been done are decisive that supposed difficulties are difficulties no longer. Whilst ignorant of what has been done privately—not yet to be disclosed, but eventually to be made public—there is reason to expect further important improvements. If the experimental illustrations already witnessed are made perfect—that is, in the sense of constancy—they will be a great advance toward lighting by electricity.

It may not be uninteresting, whilst also helpful to the better understanding of some special conditions connected with the proposed new process of lighting, if we notice wherein they differ from the conditions and methods with which we have been so long familiarized. We know of nothing, in every-day life, in which the contrasts are so great, and manipulations so wide apart, as in lighting by electricity and light by gas. If, for want of really knowing, we venture to speak of electricity as a natural product, in somewhat a similar sense as we do of coal, and the light from each as artificial light, what do we learn? Coal used, and the gas from it used to produce light, gone and irrecoverable; electricity not used, but only employed to produce light, remaining the same in quantity and quality. No diminution, no deterioration. We talk about cubic feet of gas, and reckon them by hundreds, by thousands, by millions. If these numbers appear mythical to some persons, they are real to others. But, instead of feet, suppose we try to think of acres and miles, not of gas, but of electricity, and then do what we can to add and multiply by ordinary arithmetic. What do we know—at what conclusion do we arrive? Amongst unknown quantities!

Gas differs from electricity because it can be weighed and measured, shut up in vessels, and passed from one to another, and along pipes many miles distant from the manufactory. Not so with electricity, as respects weight and dimensions. Its power (force) can be measured, but not its length, breadth, thickness, or weight. The wide world is its storehouse. For a few moments at a time small quantities of electricity can be confined, but so impatient is it of restraint, that, with or without permission, it sets itself free.

Take another phase of the two methods of lighting. Gas, as is well known, is made from coal by varied processes, through the application of apparatus, machinery, and manual labor. Its manufacture is a continuous process, controlled by seasonal changes and influences, the relative proportions of daylight and darkness. Subject to these varying conditions, there is need for forecasting, and the supply likely to be required has to be reckoned by hours or nights in advance. There must be no deficiency, but, on the contrary, there ought always to be more than enough for current demands.

What about electricity? The supply is abundant No forecasting is required. But the gathering and dispersing can be only from moment to moment, instant to instant. There can be no storing of electricity for to-night or to-morrow. It is there, always ready and willing to be used. Its gathering and dispersing—which means its application for obtaining electric lights—depend on machinery. Keep that in order, and all will go well. If that should stop or fail, the lights will go out.

There is another phase of the two methods of lighting, which further shows the contrasts between gas and electricity. In making gas, let it not be imagined that there are no mistakes, no neglects, no wearing out of machinery, no sudden stoppages. When any of these occur, which may disarrange the processes for many hours, the supply of gas is not hindred. The gas held in store is a reserve to fall back upon, so that accidental or intentional interruptions cause no inconvenience outside of the works. In lighting by electricity, to make certainty as certain as it can be by care and skill and a vigilant out-look, there must be a different kind of reserve—a reserve of machinery.

The running of engines for driving machinery day and night, and weeks and months in succession, is well understood by managers of gas works. Among their experiences are unexpected breaks down, which seem always to happen at the wrong time and in the wrong place. Engines and dynamo machines used in lighting by electricity will, no doubt, have intervals of rest—thus favorable to keeping things in order. Yet, with the best materials, the most accurate adjustments, the most careful supervision, there will be, and must be, the element of human frailty, and hence the risk and possibility of occasional failure. What will have to be done? We can think of two boilers, two engines, two machines at slower speed to do the work of one of each at higher rates of speed. But all this must be left to be worked out among the details of actual practice.

Not a word I have said, or intend to say, must be interpreted as seeking difficulties which may never exist. Lighting by electricity is not likely to end in experiments. There is no need, therefore, of merely walking around it and turning away, as if there was nothing more to be seen or known. Much better, as I believe, to do the best we can with what is known, and make no attempt at depreciation or concealment.

Has anyone thought of the difference in the aspects of gas lighting and electric lighting in their respective beginnings? Not many remain of the rank and file of gas men "who are able to shoulder their crutch and show how fields were won" in bygone years. There were then fierce contentions, misrepresentations, fears, prejudices, hostility respecting the new light, the like of which has probably never been equalled in the history of any modern invention. The progress of gas lighting, how slow it was! For many years gas was tolerated, not appreciated. The money expended in experiments—some useful, the most part useless—must be reckoned by hundreds of thousands of pounds sterling. Gas was then not considered good enough for domestic uses. It was permitted to light streets and some shops and warehouses, but not allowed indoors in private apartments. When the change came, success, being long delayed, was quickly achieved.

The electric light has come upon us at a bound—like the beat of drums and flourish of trumpets. It is thought about, talked about, written about, so as to exclude almost every other subject. The applause is almost universal, but whether rightly or wrongly accorded very few stop to inquire. This, and more than this, must be expected. But this and what may follow notwithstanding, gas light, once the light of the future, is now the light of the present, and so it will continue on and on as the most useful light for all ordinary purposes.

Some more has to be said. Let us wait a while.

*Black Rock, Brighton, Nov.* 12, 1878.

---

[From the London Journal of Gas-Lighting.

## The Electric Light.

In anticipation of the gas companies taking some action in this matter in the course of the ensuing session, I think it desirable that there should be some better understanding than there is at present as to what the light can or cannot do, and as to how far it is likely to supersede gas. I will, therefore, with your permission, offer a few observations upon this point.

It may be that what I am about to say will not convey any first information to persons engaged in gas operations, but it is to the shareholders in gas companies, and not to their officers, that these observations are specially addressed.

Managers of gas companies can readily see that if all that has been said in favor of the electric light were true, there would still not be the slightest chance of its superseding gas in a general way; but gas shareholders, having no knowledge of gas operations themselves, and seeing the grossly exaggerated statements in the papers from time to time as to what the light can do, think their property must very soon be utterly destroyed. It is with the hope of removing some of this groundless alarm that I make these observations. I have no knowledge of the scientific bearings of the question, nor of the cost, and do not, therefore, intend to touch upon these points, but to confine myself solely to the practicability of using the electric light, in substitution for gas, for the general purposes to which gas is now applied.

Notwithstanding all that has been both written and said about the electric light, the public have but a vague idea of what it is, how it is generated (is that the right word?), or how it should be used. It is very generally supposed that the electric light is produced by the burning of a stream of electricity, precisely in the same way as a stream of gas is burned. But, although the mode of using it has often been explained to the public, they do not retain the idea that it is not the electricity itself that burns, but two pieces of carbon, with which the electricity is brought into contact, and which, as they are burned out, have from time to time to be replaced by others, like candles.

It is quite impossible for any one to ascertain, from looking at the light while burning, how it is produced; nevertheless, it is important that there should be no misunderstanding as to these facts.

An electric light equal to 2,000 candles, which is about the power generally used in the public experiments, requires a very strong current of electricity, and to produce this great mechanical force is wanted; hence it would be necessary for any one who was about to adopt this light to first of all provide himself with a steam engine. Some engineers say that, under favorable circumstances, a 4-horse power engine will suffice for two lights of 2,000 candles each, and that it is not prudent to have anything less than that for one. Others say less, and others more. In

a certain case, where the light has been in use some time, and the cost is but a secondary consideration, it takes all the force of a 14-horse power engine to supply four lights.

What the actual relation of power is has probably not yet been settled; it is sufficient for this purpose, however, to know that it exists, and that the greater the power of the light, the greater must be the power of the engine.

The carbons may be used in several ways, but, as the principal is the same in all, the description of one will suffice. In the *Times* and other papers of Monday, the 4th inst., there was a report, which is probably the most circumstantial that has yet appeared, of a new mode of applying these carbons, which is described as follows:

Instead of two carbon rods or pencils, with the points placed one over the other at a certain definite distance apart, as hitherto, there is in this case one carbon rod about one-eighth of an inch thick, and a carbon disc about 2 inches in diameter, 1 inch thick, and the under side convex. The rod, being fixed in a cap or holder, is held vertically, with the point impinging upon the disc. By this mode the action of the electricity destroys the rod but not the disc, and to keep the point of the rod always in actual contact with the disc, a pair of fine cords are attached to the cap which holds it, and these are led over a pair of pulleys to balance weights, which, by pulling the rod up, keep it always in the position required. This apparatus, or whatever else it may be called, is thus essentially a part of the lamp, and whether the light is used on the drawing-room table, in the kitchen, or in the bedroom, there it must always be.

To maintain a steady, uniform light, the revolutions of the engine and the positions of the carbons must always be the same. If the motion of the engine is accelerated or otherwise, or the carbons lose their position, the light is instaneously affected by it, flickers or goes out altogether.

Any person intending to light his premises by means of electricity, whatever system he were to adopt, would, as I have said, have to provide himself with an engine to generate the electric current, an apparatus to regulate the carbons, and a stock of carbons for general use, taking special care that they were made of the right material. He would then have to make the electricity on his own premises; and as it could not be stored, it would have to be used as made, and the engine lighted up or let down as the lights were required. Every moment that the lights were burning they would be dependent upon the apparatus, and every proceeding connected with it, being maintained in good working order, as the slightest irregularity would place the whole household in darkness.

With such a contingency, who would undertake, or who would be justified in undertaking, the responsibility of lighting, by such means, a church, a theatre, or any other place where people assemble in large numbers?

One of the first serious accidents in gas lighting was caused in this way: Soon after meters were invented, one was fixed up in some very improper place in a chapel, where a person fell over it on entering, and, of course, put out the lights. Upon this there arose a cry of "fire," a rush was made to the doors, and several persons were trampled to death.

As everyone knows, gas, after being purified, is put into gasholders, and stored until required for use, and the holders, when filled, are shut off from the manufacturing apparatus; so that, whatever casualties happen on the works to affect the make, they do not, in the smallest degree, interfere with the supply. That is continued without interruption to the consumer under all circumstances. The holders, when turned off from the works, are turned on to the mains, so that as fast as the gas is drawn from the mains it is supplied again from the holders; the mains are thus always charged, and the consumers can at any time, day, or night, take whatever quantity they may require without asking permission from anyone, or making any previous arrangement about it; and as there is always a large stock on the works, any extraordinary demand, through a continuance of fogs or otherwise, is always promptly met—the supply being practically inexhaustible—without trouble or inconvenience to the consumer in any shape or way.

The promoters of the electric light ignore these advantages, and talk an act as though they believe the saving of a few shillings would outweigh them all. Our countrymen do not like to throw their money away, but they never object to part with it, and freely, too, when they can get value for it; and the saving of time and labor on the part of themselves and assistants is, in their eyes, of very great value. The public would keep to gas, even if the electricity were supplied to them for nothing, if they had to undertake the management of the light themselves.

If the electric light is ever to be a competitor with gas, it must get rid of the steam engine, dispense with the apparatus for regulating the carbons, do without the carbons, and contrive some means of "bottling up" the electrical current in large quantities, to be used on emergency.

The promoters of the electric light have all their thoughts turned in one direction, and that the wrong one—all are seeking to divide the electrical current. But not all the divisions and subdivisions in the world will avail them anything unless they can clear off these cumbrous and impracticable arrangements.

The electric light is a very old acquaintance of gas companies, and has been paying them periodical visits for the last 40 years or so. When it made its first appearance, gas was just beginning to fall in price from the original charge of 15s. per 1,000 feet; but even at that price the electric light was much too costly to supersede it. Gas is now sold for about 3s. 6d. per 1,000 feet, while the cost of generating the electric light is as great as, if not greater than, ever. Whether this gives it any better chance of superseding gas than it had before, the promoters must, of course, determine for themselves.

At the present time great importance is attached to the fact of a game of football having been played in the evening at some place near Sheffield, by the aid of this light. There is, however, nothing remarkable in this. The promoters took care to select the night of the full moon, which, good-naturedly, was shining brilliantly the whole time. When the electric light was first introduced, many years ago, the owners of the Surrey Zoological Gardens, who had shortly before opened them for evening entertainments, exhibited it for many nights in succession, to show the visitors out of the gardens after the entertainment was over; and very nicely it answered the purpose, besides being a great attraction in itself. But when the novelty wore of the light was dropped as too expensive for general use, and so it will be again.

Whenever there is anything like a success in any of the numerous experiments tried with the light, it is always trumpeted forth by all the papers with a unanimity that, to say the least, is very remarkable; but whenever there is a failure it is kept out of sight, and the public hear nothing about it.

While engaged in writing this letter I had the *Bristol Mercury* of Oct. 26 sent to me, and on an examination of it I discovered the following statement:

"A complete failure attended a football match which was to have been played at Chorley on Thursday night, by the aid of the electric light. The rain came down in torrents, but about 8000 people gathered on the grounds, and remained for two hours, while efforts were made to light the lamps, but without success. The electricians attributed the failure to the dampness, as the electricity escaped from the wires into the ground."

Since then there has been an attempt at the same thing in London, and this also, although it took place on a bright moonlight night, proved a failure. There is, however, no need to disparage the light, for it is quite equal to anything that has been said of it.

It is said that there is no danger in using the electric light, and that there is no heat from it; but neither of these statements can be strictly correct. A short time since, while I was watching a trial of the light under the hands of a skilled operator, I observed that a spark flew from his knuckles, and that he suddenly snatched his hand away, as though he had experienced something he did not like. On mentioning this to a gas director shortly after, he said his own chairman had, like many others, been over to Paris, to ascertain some particulars about the electric light, and while there had been told that, very shortly before, one of the operators had inadvertantly brought the current of electricity upon himself, and had the bone of his arm shivered up to the elbow.

This is a casualty that it is impossible to get rid of, and whoever has charge of the light—master, man, or maid—will always be liable to it. A moment's inadvertance might at any time injure the operator for life.

At the same trial, in the absence of the operator, some irregularity occurred in the apparatus, when the soldering of the three brass rods that supported an opal shade suddenly melted, the rods fell down, and the upper rim of the opal shade falling against the upright bar of the apparatus, the shade itself began melting, and would have been quietly burnt through from top to bottom had not the operator returned and removed it.

It may be that the heat from this light, supposing it to be equal to 2,000 candles, is very much less than the heat from a gaslight of the same power; nevertheless, it must be very great in itself. This trial was made in a room 100 feet long 44 feet wide, and 30 feet high. The light, which was said to be equal to 2,000 candles, was at first placed at one end of the room, about 6 feet from the floor. Part of the time it was used with an opal shade, and part without. Close to the light there was a considerable difference between the shade being off and on; but at the far end of the room this difference was scarcely perceptible, and at that distance it was just possible to read and write by the light, but not comfortably. It was then suggested that the light should be placed in the centre of the room, and raised somewhat higher. This suggestion was acted upon, and the light raised to about 10 feet from the floor. In this position the opal shade was not used, but a copper silvered reflector was placed underneath the light, so as to exclude it from the sight of all persons below. The light was thus, in the first instance, thrown by the reflector upon the ceiling and the upper part of the walls, and from thence deflected, as it were, upon the tables below. The walls being white as well as the ceiling, this had a very good effect, and produced a clear, bright light all over the room, and had the room been 20 feet longer the light would probably have been equally good to that extent—that is, a radius of about 60 or 70 feet, or say 25 yards. The room in which the trial was made is ordinarily lighted with gas by four sun-lights, each light burning seven rings, and each ring 9 small jets; making in the whole 252 jets, each of which would burn about 2½ or 3 feet per hour, but say 3 feet, which would make their united consumption 756 feet per hour, and the electric light was quite equal to this. A sun-light, however, is not by any means an economical mode of using gas, although it has its advantages; and where many persons congregate in one room, some such arrangement of light is almost obligatory. But eight burners, of Sugg's "London" standard, placed on the tables on each side of the room, and which at the ordinary rate of 5 feet per hour would only have consumed about 80 feet of gas, would have given light enough for all ordinary purposes; and 12 on each side, which would have only consumed 120 feet, would have given a much better light than either the sun burners or the electric light.

Gas, in a general way, is described as of so many candles illuminating power, and the average quality

throughout England is, perhaps, 14 candles. But the public do not fully understand the meaning of this; they think that 14 candles is a fixed and definite quality, and not merely a relative one. When, therefore, they hear of an electric light being equal to 2,000 candles, they think it is hopeless to expect that gas can ever be brought up to this high standard, and, consequently, that it must be superseded. But something more than a difference in the illuminating power is required for this.

Few persons, besides those engaged in gas matters, understand the bearing of this question of illuminating power. The public, although the matter is so often before them, do not bear in mind that, in speaking of gas as being equal to 15 or 16 candles, it merely means that that particular quality of gas is equal to so many candles when used in a certain way, and under certain conditions, the burner and rate of consumption being strictly defined. They do not seem to know that the same gas, if used with another burner, larger or smaller, and with a greater or less consumption, will, under the same testing apparatus, show perhaps as little as 8 or 10, or as much as 20 or more candles.

A short time since I was shown by Mr. Sugg a burner that was equal to 50 candles, and yet it was but very little larger than the "London" standard; and doubtless, if it were desirable, he could easily make a burner that would be equal to 2,000 candles; but it would use a great quantity of gas, and make a large body of light.

The size of the electric light, whether it represents 2,000 candles or any less or greater number, is always the same, or apparently, as the increase of illuminating power with electricity is caused by an increase in the intensity, and not in the size of the light. On this account—that is, the greater body of light—gas has, and always must have, where large lights are required, a considerable advantage over electricity. Of two lights, each representing 200 candles, one gas and the other electricity, the former, because of its larger volume, would show a very much greater distance than the latter. The electric light is said to be very soon lost in a fog.

If the system of lighting large rooms or public places with one very large burner is found preferable (and it may be so) to the present system of having a number of, comparatively speaking, small ones, the large burners can be supplied by gas, and adapted to the size of the room or space, more economically, cleanly, conveniently, and better in every other way, than electricity.

It is well known that many things may be used to supplement, and to a very considerable extent, the illuminating power of gas. It is possible, therefore, with gas, to give both the large volume of light and the increased brilliancy together, but to do this the purse strings might have to be loosened a little.

On the re-introduction of this light on the present occasion, it seems to have been recognized from the first that if the consumer was required to have in his own house a steam engine to generate the electricity, a machine on his drawing-room table, or wherever else the light was used, to regulate the carbons, and to purchase those carbons himself, at his own risk, it would be useless to try and persuade any one to adopt such a light in lieu of gas, with which there is neither steam engine, apparatus, carbons, time, or trouble of any sort required, and accordingly, for a long time after its re-introduction, nothing was attempted in that direction. But a report having been circulated that means had just been discovered in America, and communicated by telegram to this country of dividing the electric current, whereby it might be conveyed by wires, in tubes under the streets, to the consumer's premises, in the same way as the ordinary telegraphic messages, and the leading papers having all taken up with a somewhat remarkable unanimity, the shareholders became alarmed, and the present depreciation of gas property is the consequence. It does not, however, appear that there was ever any just cause for this alarm, or that anyone ever seriously proposed to light a town in this way. Nevertheless, the report has had its effect, and those who originated it have doubtless found their advantage, in some shape or other, in doing so.

The public have been entertained for several months with experiments to show the effect of the light, and the various ways of using it, and they are now getting weary of them. What they now want to know is, Can it be carried out, as a commercial undertaking, with any reasonable prospect of success, or not?

It is remarkable that not one of the promoters has ever put forward any scheme for using it in substitution for gas, or attempted to show how it would be possible so to do, and all such information as would enable the public to form an opinion of their own upon this point has always been, and still is, withheld.

The light has been exhibited for a time in one place after another, to attract attention, and then withdrawn; but nowhere has it been "domiciled," and the public think that, in a large place like London, many persons might be found charitable enough to have given it a home, had it been deserving of one. But, in truth, it has been hawked about so long that its character has got "blown upon," and it is now known to be what our worthy Scotch friends would call a hopeless "Ne'er-do weel," that will "gang its ain gait," doing those things which it ought not to do, and leaving undone those things which it ought to do, in spite of all the good advice of its numerous friends and supporters. Well-born, highly educated, brought out under the most favorable auspices, and introduced to the best society, surrounded by staunch friends, brilliant and facinating in its ways, but with such expensive and, it must be admitted, irregular habits, that no one will have anything to do with it.

The exigencies of gas lighting may be described as follows, viz.:—One house may require 30 feet per hour, the next 1,000, the next 20, the next 500, the next 10, and so on. One house may use the gas in the front shop only, another in the back premises, for the workmen, another in the sitting-rooms, another in all parts of the house, and so on. One house may require the gas in the evening only, when it is dark; another all day, for business purposes; and another all night, and so on. The mains, therefore, must always be charged, day, and night, and be open to the gasholders, so as to allow the consumers to draw any quantity they require, as and when they require it, without consulting any one, or making any previous arrangement about it: the gas supply being a "constant supply" in all its integrity, which means "any quantity you want, at any time you want it."

When the promoters of the electric light can prove to the satisfaction of the public that they are prepared to supply their light with all the conveniences, or something nearly approaching them, they may stand some chance of getting the lighting out of the hands of the gas companies into their own; but until then gas companies have nothing to fear from the electric light.

Mr. Werdermann's discovery, referred to before as having been reported in the *Times* and other papers on Monday, Nov. 4, is described as follows:—A conducting cable is laid on from the machine to the row of lamps, and from it ten wires were led up, one to each lamp, resembling in its appearance a gas-main with its supply pipes. The current produced by the machine is led along the main cable, and through the supply branches to the lamps, passing through the positive carbons in each, and then through the disc, or negative carbon, and so away, by a return cable, back to the machine. The lamps, being the first made by Mr. Werdermann, were more or less experimental; they however, illustrated the principle exceedingly well, giving a steady though small light, of very good color and moderate intensity. The divisibility of the current was clearly demonstrated, as was the power to extinguish and re-light one or any number of the lamps in the series without affecting the remainder, except to increase their intensity. Mr. Werdermann added, "The proportion of horse power absorbed by each light would be less and less, as the number of lights was greater. The greater the number of lights, the greater would be the quantity of current required. The longer the distance traversed by the current, the larger must be the electro-motive power."

This discovery proves conclusively, although it was well known before, that a strong electric current can be divided into a number of smaller currents; but we apprehend that the discovery consists in the new mode of using the carbons, which certainly appears to be a great improvement on anything hitherto proposed. It does not, however, prove that the electric light can be applied to the ordinary purposes of gas lighting; on the contrary, like all other exhibitions of the same character, it does more to prove that the electric light is not applicable to the ordinary purposes of gas lighting than otherwise.

The report in the *Times* says, with regard to the cost of producing the light, and the photometric value of it, "We can say nothing, inasmuch as the machine was driven from an engine of far higher power than it would of itself require, and there were no means of ascertaining the value of the light photometrically."

In these public experiments there is almost always some apology given for something not having been done, whereby something else might have been explained; and it is always the points upon which the public are most desirous of getting information, and upon which alone they can form an independent opinion, that are kept back.

The experiments and reports are all one-sided; that which is most advantageous to the object in view is brought prominently forward, and every thing else kept out of sight.

The chief points upon which the public most desire information, may be described as follows, viz.:—

What proportion of steam power is required to produce a currrent of electricity of a given strength—say for a light equal to those generally used for public exhibitions, which are said to represent 2,000 candles?

Does the current lose its force, as gas loses its pressure, by distance; and if so, at what distance from the engine can it be used without any serious depreciation?

Does the current lose its force by being divided; and if so, to what extent?

In the report of Mr. Werdermann's experiments the power of the initial or main current is not given, but it is stated that the main current was at first divided into two lights, which were equal to 360 candles each, or 720 the two, and then into ten lights of 40 candles, making 400 in all. Does this represent the actual and unavoidable loss on division, or is it merely accidental?

When the main current is divided into a number of smaller currents is it necessary that the wires for the smaller currents should be of the same length and strength, and for each light to be at the same distance from the main current?

It is the opinion of some scientific men that this is so, and the report of the proceedings in Mr. Werdermann's experiments leads to the belief that it was so in his case.

Can the main current be so divided as to give a light equal to, say, 40 candles in one house, 300 in the next, 1,000 in the next, 500 in the next and so on?

If the main current could be so divided, would it be possible for each consumer to light up or put out one or all of his lights without prejudice to his neighbors? And could he also turn them up or down, as well as on and off?

On this point the report of Mr. Werdermann's proceedings says: "It is that gentleman's intention to introduce a supplementary wire equal to the resist-

ance of any of the lights on being turned off, to prevent its affecting any of the other lights,"—an admission, in fact, that the lights could not be turned down, but would have to be used with the full force of the current, subject to its being decreased as other lights were put on, and increased when they were turned out.

Assuming that ten small currents were "laid on" to ten separate houses, would not the force of the current to each house be dependent upon the number of other houses and the lights burning therein at the same time? If one were burning by itself, would it not have the whole force of the main current until some of the other houses were lighted up and took part of it away? Would either of these ten consumers be able to further divide the current "laid on" to his premises if he wanted more lights, or would he be obliged to heve another current laid on?

Assuming that a main current were divided into as many small currents as it well could be—say ten, for illustration—and one, two, or three adjoining houses wanted to have the light. What then? Would it not be necessary to put up another engine, and, perhaps, purchase other premises, to keep within the travelling distance of the main current? When the motion of an engine is accelerated, and the electric current is increased suddenly, by that or any other means, do not the carbons, one and all, throw down sparks, and occasionally burning flakes of the carbon, on to the table or floor, as the case may be?

If all these points were gone thoroughly into, and fully explained to the public, there is not the slightest doubt but that they would, one and all, be decided against the light, and prove beyond dispute that it cannot be applied to the ordinary purposes of gas lighting, and that it would cost very much more, even if it could.

As some illustration of the cost, it may be stated that the consumption of gas is probably four times as much in the depth of winter as it is in the height of summer; but the engine power would have to be proportioned to the winter consumption; and to allow for casualties and repairs, and guard against any district being left in darkness, it would be necessary to always have two engines, each equal to furnishing the winter consumption. In many large districts there are perhaps only one or two consumers who use gas in the daytime, and about the same number who use it all night; but so long as there was one light burning, it would be necessary to keep up the engine, and this expense would be very nearly the same, whether there was only one light burning or the whole force.

The mode of estimating the cost is, so far as can be judged from the public statements, as delusive as everything else connected with the light. For instance, a railway train with 400 tons of coal, ready for starting, might be brought to town at an actual outlay of about £2; that is, the drivers, stokers, and guards wages, and the coal being about 1¼d. per ton; but who would say that this was a fair way of estimating the cost of bringing coal to London? Nevertheless, this is the way in which the promoters calculate their cost; but when they make a comparison between the cost of an electric light and gas, they put the cost of the latter at the price at which it is sold, not that at which it is made.

If all the difficulties about the supply were satisfactorily adjusted, there would still be another, and that by no means a trifling one, and that is, how to make a charge for the light. Unless our friends on the other side of the water have discovered a means of supplying electricity by meter, this whould not be an easy matter to settle equitably.

I now come to the consideration of what steps, if any, the companies should take in this matter; but before considering this we ought to get a clear understanding of what the position really is.

The electric light has been known in this country for 40 years or more, and the use of carbons in connection with it for probably the same time; there cannot, therefore, be any patent right for the exclusive use of either one or the other. Consequently, every individual in the community has a right to use them both for these purposes, if he thinks fit. Under these circumstances, parliament itself, constitutionally speaking, has no power to grant an exclusive right to any one, as by so doing, it would deprive the whole community of an existing right. It would therefore be utterly futile to expect that any exclusive right to its use would ever be granted. There may, however, be at the present time, or may arise hereafter, some patent right as to the using of the carbons of a particular form, or for making them of some other material, or substituting something else for them; and the beneficial use of the light may be dependent on these. If, therefore, parliament gave the exclusive power, the companies might not be able to exercise it.

The companies at present have the power of opening the streets for supplying gas, but nothing else. If, therefore, it were possible to supply electricity through tubes in the streets, the companies might reasonably say, "As we have already the power of opening the streets, it will be as much to the advantage of the public as ourselves for the power to be continued in our hands, instead of being given to another company."

If we dismiss from our minds all thoughts of conveying through the streets currents of electricity for lighting purposes, as we must, and assume that people would use it in their own houses, what could the companies ask for? They could not undertake to supply electricity, as that is beyond the power of any one. They could only supply the engines and apparatus, or, in other words, turn manufacturers.

Under existing regulations the companies are only authorized to supply gas; if, therefore, electricity, or anything else, were discovered to supersede gas, the companies would not be able to supply it themselves, whatever it might be, but would have to sit still, with their hands tied, while their property was being destroyed.

This would manifestly be a great injustice, which, it may be safely inferred, no government would desire to preserve. It may, therefore, be desirable, apart from all considerations as to whether the electric light can, under any of the present proposals, be adopted as a substitute for gas or not, to get this prohibition removed before any real necessity for its being so removed arises.

Any company intending to apply to parliament in the next session for further powers, might reasonably insert some provision for removing this disability; but for any company to make special application for such a purpose would, I think, be throwing money away, as, if it is dealt with at all, it must by by a public bill. The companies need not be under any special anxiety about it. The local authorities are in the same position. It is true, they can light the public lamps with anything they please, but they can only supply private consumers with gas. It is probable that they will be the first to move in it.

The Metropolitan Board of Works have undertaken to try the electric light on the Embankment for three months, the Board paying one portion of the expense, the promoters—the Compagnie Générale d'Electricité—paying the other, and when that is accomplished it may be possible to get some approximate idea of the cost, which at present it is not.

The electric light, such as those about to be tried on the Embankment, which are said to be equal to 2,000 candles, gives an intensely brilliant light within a certain radius, but at a hundred yards distance it is not as good as an ordinary gas lamp. In the best lighted localities of London the lamps are placed at about 50 yards apart, but in others they vary from 50 to 100 yards, and even more.

An electric light placed in a large open space, where it could be seen in all directions, might supersede five or six ordinary gas lamps, but in a road or street, where it could only be seen in one direction, it would not supersede, even in the best lighted places, more than three or four; and, taking into account the irregularities of our streets—the London streets not being remarkable for straight lines—the average probably would not be more than two; but the lighting will never be improved by having the lamps wider apart.

That many parts of London are badly lighted no one can deny; but this arises from the simple fact that the lighting is controlled by the various local boards. The companies supply the gas, and the local boards determine how many lamps shall be used, and in what positions they shall be placed. How the lamps got tumbled into their present places at first, it would be futile now to inquire; but in many localities they certainly do appear to have been put up very capriciously. Not the slightest notice ever seems to have been taken of the width of the road. This, however, was all done before local boards were created.

The local boards of the present day put their faith in burners consuming 5 cubic feet per hour, and, whether the lamps are 50 or 100 yards apart, or the road 30 or 50 feet wide, they expect to get the same amount of light, simply because they have the same description of burner. When people see the streets badly lighted, they attribute it to the gas companies, whereas the latter have no voice in the matter.

The great need in London at the present time is some controlling power to insist on the lamps in all the leading thoroughfares being placed at certain distances apart, having regard to the width of the roadway, and using 5 feet burners in some places, 7 feet in others, and 10 feet in others, if need be. If this were done, no one would wish to have the electric light.

W. Livesey, Secretary.

Gas and Water Companies' Association, 5 Victoria street, Westminster, Nov. 9, 1878.

## Let There be Light.

The experience through which Brownsville is now passing proves beyond the possibility of a doubt modern improvement, manifested in a thousand discoveries and inventions, is not only of superior convenience and utility over old modes and methods, but approaches the bounds of necessity. The faint, thin glow of a solitary candle, or the smoky, evil-smelling blaze of a coal-oil lamp, are but sorry substitutes for the bright and cheerful gas. It is wonderful how much has been done by candles, and how it was done at all. Yet for unnumbered years mankind relied upon them to give light by night. How often have they shed a sort of dim radiance over the festive scenes of the past. The ball room, the wedding scene, the theatres of old, the courts of majesty itself were lighted by this imperfect means. Our ancestors did their courting by home-made candles, and doubtless thought then the candle ought to be turned down a little. The old candlestick, with its inseparable companion, a pair of brass snuffers, were in the olden time familiar objects. Once every two weeks it was a prime household duty to mould candles, for sperm or wax candles were not to he used except for company.

These things have passed away, and however much we may regret to part from old customs and usages, yet we heartily rejoice that we have come to better things in the march of modern invention. We have been for many weeks relegated back per force to the old methods of light used by a generation passing away. We have had to rely upon candles and lamps to give us light, and the great superiority as well as cheapness of gas is prominently brought before us. We have been compelled to suspend all night assemblages—church among the rest—on account of the want of gas; but we are glad to state that this will be the case but a few days longer. The proprietor of the gas works, H. B. Folk, Esq., at the breaking out of the pestilence, had just made preparations for the manufacture of coal gas, in place of oil gas, thereby giving his patrons a superior article to the gas heretofore used. The pestilence, however, prevented the contractors, the Laclede Fire-Brick

manufacturing company, from going forward with the work until a few days ago. Mr. Hart is here now, engaged in putting in new retorts, and adding to the gas works entirely new and expensive machinery, of the latest pattern, for the manufacture of gas. The gas made by this improved machinery will be purer and give better light, and be far more economical to the consumer than any we have ever had in this city. It will give a bright white light, without smoke or disagreeable odor. The work is being rapidly put forward, and by the 1st of December our city can boast of as fine gas as any city in the South. Mr. Folk deserves great credit for his liberality and enterprise in his effort to give our citizens superior light, and he should receive a generous patronage and support from the public. Gas is as much a modern necessity as the railroad or steamboat. We shall hail its return to our city with unalloyed pleasure. It is not only a source of great comfort in social life, but it is more. It is one of the best police agencies in any community. In its bright light the thief and burglar sneak away, and crime and vice, rebuked, steal foiled into their dark retreats.—*Brownsville Democrat, Nov.* 20.

## Gas as Fuel.

The remarkable decline in gas stocks noted in a previous article continues, as appears by comparing the figures for the first of last month with those for the first of October and several months previous In Great Britain there have been three panics in gas stocks within the last two years, and since this year opened the decline ranges from 12 to 65 per cent. So far as this decline is the result of the reports about Edison's invention, it is a remarkable tribute to the reputation of a genius whose productions have thus far been wonderful rather than strictly utilitarian, and also an evidence of the known vulnerability of the gas companies' position. Electric light, like electric power, is no new subject; its practical difficulties have been known for twenty years, and, although great progress has been made in electrical science, and there is no reason for doubting the ultimate solution of the problem, experiments already made hardly warrant fixing any date for that solution. The fact, however, that a mere report sets gas stocks tumbling proves the great defectiveness of the gas supply, for no business resting upon a substantial foundation could be so shaken by a mere threat of annihilation. But the threat is not really one of annihilation, and the fact that the gas companies have so grossly misunderstood it is evidence of their own consciousness that their shortcomings deserve no better fate than to have their occupations destroyed as completely as the friction match destroyed the tinder box.

Suppose the boldest anticipations of the inventor are soon realized, and that the electric light supersedes gas as an illuminator, the disuse of the latter by no means follows. No city resident can be unaware of the objections to the use of coal in dwellings. The "heater" and the furnace are generally hot in mild days, and cool in cold ones; at breakfast, cheerlessly dull, and over-bright at bed-time; the lower part of the house too hot, and the upper too cold, and the windier the weather the less efficiently the heat will rise. At best, the heat they supply is dry and burned, laden with the odors of combustion, provocative of colds, headaches, and languor. As for stoves, it is impracticable to put them in every room; and as for the range, the kitchen has its own troubles. No possible improvements in the fixtures can remove these defects, inherent in the process of coal-burning; the dirt, labor, inconvenience, injury to health, discomfort, consequent upon the present method of obtaining heat—the rare use of steam and hot-water circulation excepted—form a chapter of troubles and make our domestic economy, in this important particular, fifty years behind the times. Perhaps the majority of well-to-do people have used gas more or less for cooking in the Summer, but comparatively few understand its advantages. Unless used for the purpose of giving heat, it works with the minimum of heat: is instantly ready for work without waiting, runs indefinitely without fluctuating, and is "out" the instant it is no longer wanted; the labor is only the same as that of managing an ordinary burner for light, and there is no dirt of any sort. There need be no odor. On the Bunsen burner, properly used, every culinary operation can be performed; meat can be cooked directly *in* the flame, with a better flavor than when coal is used. Gas, in fact, is always used the process of combustion being simply one of evolving heating or luminous gases, the solid fuel being present merely that its oxygenation may evolve those gases. If we have the gases for heating without the coal, we obviously no more need the latter than we do for light; and, on the merits of the case, it is as needless, absurd, and objectionable to make our own heat by burning the coal as it would be to make our own light.

Nothing has imposed the necessity of burning solid fuel but the prohibitory cost of the ordinary illuminating gas. As yet, it must be admitted, there is no fixture for gas which would adequately do the work of the cooking range, but such a thing can soon be supplied, and the only reason why it has not been already is that the cost of gas has barred its invention. For the short time needful for cooking in summer, and allowing for the combustion of coal before and after the work is done, gas at present prices is just about as cheap as coal; hour for hour, however, it probably costs several times as much as coal. But the prohibitory cost is that to the consumer; to the companies—which deliver it at $2.50 per thousand, of an illuminating quality which they alone determine, and the quantity measured by meters which can tell just as large lies as they choose—the cost of manufacture is from 60 to 75 cents. There is margin enough here for more than the trivial reduction already compelled by kerosene, but the solution of the problem does not lie wholly in this margin between reasonable and actual profits. There is justification for the belief that, under conditions already existing, a non-luminous gas, estimated to furnish a flame 900° hotter than that of ordinary illuminating gas, which will do its work without either the use of the Bunsen burner or the preadmixture with air, can be made and delivered into the holders ready for distribution at a cost of ten cents a thousand. At this rate it could be supplied at 50 cents or less; and thus, the cost of ordinary gas, burned for heat after mixing with air, being to that of coal as two or three to one, the cost of the gas just described would be to coal as 2-5 or 3-5 to 1, or probably even less. Inasmuch as gas is very nearly a perfect form of fuel, and, to say the least, compares as favorably with coal in respect to its advantages, as the best modern plow compares with a crooked stick for breaking the sod, there is occasion for housekeepers to take courage.

Nothing but the greediness and blindness of the gas companies—greediness being generally blind—has compelled the endurance of this coal nuisance until now. The companies have been so greedy that they have preferred to remain the most odious of monopolies, intent upon immediate profits and imagining themselves immovable, rather than move with the age or even keep informed of the researches of science. They have always been quick to remove any obstruction in the flow of gas, because able to see their interest in promoting large consumption; yet they have been unable to see the advantage of cutting down their price one-half and quadrupling their consumption. And they are still so blind that they are panic-stricken because of reports that the electric light is ready to extinguish theirs, and fail to see the vastly greater field which lies now—as it has lain for years—ready for their occupancy in furnishing gaseous fuel. If the electric light does not develop itself as expected, they have a further opportunity to use the liberal business energy which is the foundation of secure profits; if it does drive them from their present occupation, their plant is all ready to make the change, and in either event any panic is causeless. If they neglect to appropriate the business of furnishing cheap gaseous fuel, no matter what becomes of the electric light, they will simply continue pulling down their own fortunes by making the introduction of steam heating more inevitable and speedy.—*N. Y. Times.*

## The Origin of Horn Lanterns.

As many persons are unaware of the origin of horn lanterns, it may not be uninteresting to refer to it here. The inventor of the horn lantern was, according to Asser, none other than Alfred the Great. He (Alfred) was steady and persevering, regular in his habits, when not kept in the field by the Danes, and a great economist of his time. Eight hours of each day he gave to his sleep, to his meals, and to exercise; eight were absorbed by the affairs of government; and eight were devoted to study and devotion. Clocks, clepsydras, and the other ingenious instruments for measuring time were then unknown in England. Alfred, however, was no doubt acquainted with the sun-dial, which was in common use in Italy and in parts of France; but this index was of no use in the hours of the night, and would frequently be equally unserviceable during our foggy, sunless days. He therefore marked his time by the constant burning of wax candles or torches, which were made precisely of the same weight and size, and notched in the stem at regular distances. These candles were twelve inches long; six of them, or seventy-two inches of wax, were consumed in twenty-four hours, or 1,440 minutes; and thus, supposing the notches at intervals of an inch, one inch would mark the lapse of twenty minutes. It appears that these time-candles were placed under the special charge of his mass-priests or chaplains. But it was soon discovered that sometimes the wind rushing through the windows and doors and the numerous chinks in the walls of the palace, consumed the wax in a rapid and irregular manner. Alfred went skilfully and wisely to work, and having found that white horn could be rendered transparent, like glass, he, with that material and pieces of wood, admirably (*mirabiliter*) made a case for his candle, which kept it from wasting and flaring.—*Ironmonger.*

## Growth of the Steam Engine.

By Robt. Thurston, A.M., C. E.

This little work contains the more essential parts of a course of lectures delivered at the Stevens Institute on the subject. As a history of the progress of the steam engine the book is of great interest; but as a compendium of the principles and practice upon which the successful operation of steam motors depend, as well as an explanation of the causes and extent of loss of heat in the steam engine, the book is of special value.

## King's Treatise.

Bound copies of Volume I., containing the first eighteen numbers of King's Treatise, on the Manufacture and Distribution of Coal Gas, are now ready and for sale at $10 per Volume.

Orders sent either to Chas. Nettleton, 150 Broadway, New York, or to this office, will be promptly filled.

To those who have neglected to subscribe for this most valuable publication, as it has appeared in monthly numbers, this affords a rare opportunity for procuring the first volume of the latest, fullest, and most complete work on this subject. The work is published by the *Journal of Gas-Lighting*, London, and is edited by Thos. Newbiggin, M.I.C.E., and W F. Fowtrell, F.C.S., and will be completed, as we are informed by the Editor, in 36 numbers, or two volumes of 18 numbers each.

THE AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY

A. M. CALLENDER & CO.,

PROPRIETORS.

Editor—G. WARREN DRESSER.

PUBLISHED ON THE 2ND AND 16TH OF EACH MONTH

At No. 42 Pine Street, New York.

This is a recognized official organ of—
LIGHT, HEAT, STEAM, WATER-SUPPLY,
VENTILATION, SANITARY IMPROVEMENT,
AND GENERAL SCIENCE.

TERMS

SUBSCRIPTION—Three Dollars per annum, in advance.

AGENTS

NEW YORK—AMERICAN NEWS COMPANY, 119 and 121 Nassau S
BOSTON—S. M. PETTENGILL & Co., 6 State Street.
PHILADELPHIA—PRATT & Co., Corner 9th and Arch Streets.
*Germany*—B. WESTERMANN & Co., of New York.

MONDAY, DECEMBER 16, 1878.

**Official Report of Examinations of Gas for two Weeks ending Nov. 23, 1878, made at the Photometrical Room of the Department of Public Works.**

**Corrected Illuminating Power.**

| Nov. 1788. | Time of Day at which Test were made. | New York Gas-Light Co. | Manhattan Gas-Light Co. | Mutual Gas-Light Co. | Metropolitan Gas-Light Co. | Harlem Gas-Light Co. | Municipal Gas-Light Co. |
|---|---|---|---|---|---|---|---|
| 25 | Between 9.30 A.M. and 1 P.M. | 16.74 | 17.20 | 17.82 | 16.94 | 16.15 | |
| 26 | | 16.03 | 17.31 | 18.34 | 17.08 | 16.40 | |
| 27 | | 16.52 | 17.20 | 18.78 | 17.23 | 16.52 | |
| 29 | | 16.46 | 17.99 | 19.01 | 17.19 | 16.20 | |
| 30 | | 16.13 | 17.46 | 18.57 | 17.00 | 16.23 | |
| | Average | 16.37 | 17.43 | 18.50 | 17.08 | 16.30 | |
| Dec. 2 | | 16.72 | 17.13 | 18.56 | 16.81 | 15.03 | |
| 3 | | 16.54 | 16.88 | 18.13 | 16.89 | 16.29 | |
| 4 | | 16.27 | 16.84 | 18.26 | 16.93 | 16.57 | |
| 5 | | 16.00 | 16.54 | 19.92 | 17.01 | 16.50 | |
| 6 | | 16.15 | 17.34 | 19.09 | 16.96 | 15.54 | |
| 7 | | 16.34 | 17.47 | 19.48 | 17.46 | 15.54 | |
| | Average | 16.33 | 17.03 | 18.90 | 17.01 | 15.89 | |

Sugg-Letheby burner.

E. G. LOVE, Gas Examiner.

**A Fatal Accident** has occurred at the Beckton Gas-works, North Woolwich, to a driller, named Jas. Richards, at the Pier Extension Works. It was surmised that the planks which formed part of a sling platform had slipped from a ledge upon which they had been resting, and that the deceased fell feet foremost and stuck in the mud, the tide being low. The foreman of the works stated at the inquest that this firm had put up 2,500 tons of iron at the pier, and there had not been the slightest accident until now.—*Ironmonger.*

## Correspondence

[We are not responsible for the opinions expressed by Correspondents. Correspondents, in all cases, should sign their communications with their names and address in full—not for publiction, unless desired, but as a guarantee of good faith.—ED.]

### Coke in Cleveland.

OFFICE CLEVELAND GAS-LIGHT & COKE CO.,
356 SUPERIOR ST., CLEVELAND, O. Dec. 6.

*Mr. Editor:*—The *amende honorable* is certainly due to my friend Geo. H. Warmington, president of the Peoples Gas-Light Company, of this city, from either the reporter of the JOURNAL who took down my remarks before the Gas-Light Association, upon coke and coal, or myself. I presume I am the debtor in the case, although it seems to me that I must have said something limiting the time when the facts to which I referred existed. But possibly I did not, and am not disposed to shirk the responsibility and escape the blame.

When I read the report of what I said upon the topics mentioned, I felt that if I was correctly reported I had thoughtlessly omitted an important point, and that my friend of the Peoples Company might naturally feel annoyed. Hence, when I next met the engineer and superintendent of the Peoples works I apologized to him for doing his company an injustice, and as Mr. Warmington has thought the matter of enough importance to carry it into the JOURNAL, I now enter an apology to him, thanking him, at the same time, for giving me the credit of not doing the wrong intentionally, which is simply the truth.

Since Mr. Warmington's communication appeared I have made some examination and inquiry, and find that about nine of ten years ago, when the Peoples Company's works were only two or three years old, and before Mr. Warmington became president and Mr. Lindsley superintendent, and when the consumption of gas on the west side of the Cuyahoga was small, the facts were substantially as I have stated them. The foreman of the works of this company tells me that he was often at the Peoples Company's works in those days, and that the facts stated in my remarks were well known to him. Also, that he and I were there together on one occasion—that we both noticed the manipulation of the coke, and, after leaving, discussed the matter, and both agreed as to the cause of the coke being slow of sale; for such was the fact at that time, although Mr. Warmington seems to think otherwise. Soon afterward the superintendent died, and the present efficient engineer took his place. Other changes followed: the companies business increased, the works were enlarged, and, I have no doubt, the business is well conducted.

My only reason in speaking of the facts, as they existed some years ago, was simply to illustrate a view which I think of some value, but I need not have referred to my neighbor's experience, or, if I did so, should have been careful to mention the time when that state of matters existed, and should have said that nothing of the sort had occurred since the present managers have had charge. Although Mr. Allen did, in those early days of the Peoples Company, complain to our foreman that he was furnished with poor coal, my general remarks in regard to the use of such coal had no reference to the Peoples Gas Light Company. I had in mind a case much further off, but fortunately gave no indications by which it could be located.

In conclusion, I may say that I attach considerable importance to the doctrine maintained in my little talk, to wit, that the true policy is to use the best coals, manipulate them in the best manner, and, by producing good coke, secure an active demand for it.

With the best feelings for all concerned, and "with malice toward none," I am, very respectfully, etc.,

W. H. PRICE.

## Death of Samuel Lewis, President of the Detroit Gas-Light Company.

3912 SPRUCE STREET, PHILA.,
November 26, 1878.

*Mr. Editor:*—Samuel Lewis, President of the Detroit Gas-Light Company, died in New York at the Glenham hotel, on the 18th inst.

Mr. Lewis, Mr. Wm. H. Price, of Cleveland, and one or two others, united in the first informal call held in Cleveland, in the winter of 1873, to form a gas-light association, out of which the present Gas-Light Association grew. This I know of my own personal knowledge.

I inclose a slip taken from a Detroit paper, from which in can be seen in what estimation he was held in the community in which he lived.

Yours respectfully,

W. H. WILLIAMS.

Samuel Lewis, whose illness was announced in the *Free Press* of Sunday morning, died in New York city at half-past ten o'clock last night. The announcement of his death will be a shock to hundreds of citizens of Detroit, who knew him as a man of noble and generous qualities, which gave him a place in the affections, as well as in the esteem of the people among whom he passed his life. Mr. Lewis was for many years a representative business man of Detroit, in the forwarding and commission line, but of late years his rank in the business world was that of a capitalist. He was largely interested in the Detroit Gas-Light Company, of which corporation he was President at the time of his death, and one of the directors of the Detroit Savings Bank. For many years —for more than a generation—there has been no more familiar figure on the streets of Detroit than thas of Samuel Lewis. There was that in his disposition which made him one of the most approachable and companionable of men. His gentle nature prompted him on all proper occasions to put his hand deep into his pocket for the relief of the afflicted; and when money would not serve the purpose, his words and his acts of consolation were applied always in a spirit that betokened the broadest charity for human kind. For years he was actively and heartily concerned in the special work of relieving the necessities of the extremely poor. The record of his last year's service alone in that direction is sufficient to raise for his memory a monument of gratitude in the heart's of Detroit's poor. For months he gave almost his entire time to collecting funds with which to lessen the sufferings of the poor, and to the work of personally investigating the circumstances of persons who applied to him for assistance. It may truly be said of him that, while he did not give with an indiscriminate hand, his responses were always generous, frequently munificent. To lessen the ills of poverty was one of his chiefest delights, and the unostentatious manner in which he "went about doing good" was eminently characteristic of the man. He despised sham and shoddy as earnestly as he admired simplicity and directness. His large experience with men and affairs, much of which he gained in travel abroad, made, in the broad meaning of the phrase, a man of the world—a true cosmopolitan; but Detroit was his home, and here were gathered the fruits of his useful life, where also were centered the joys that made up the sum of his truest and highest happiness. In disposition he was the embodiment of frankness and personal honor. His simple word would have been received in any court as implicity as his oath, while his suave manner, which was the expression of his regard for social forms, will be remembered as one of his most characteristic traits. Few men of Detroit could have died and left behind them more sincere mourners than Samuel Lewis. Of his immediate family one son and two daughters survive him. Ex-Mayor Lewis and Thomas Lewis, both of this city, also survive him. The remains will be brought to Detroit for interment.

## Experimental Determination of the Velocity of Light.*

This paper was considered one of the most important before the section, but it is impossible to present a proper idea of it without the diagrams accompanying it. But three scientists, Foucault, Fizeau, and, more recently, Cornu, Mr. Michelson, said, have sought to ascertain accurately the distance of the sun from the earth. Foucault used the method known as that of "Wheatstone's Revolving Mirror," the application of which was first suggested by Arago. Fizeau and Cornu both used another method, known as that of the "toothed wheel." In Foucault's experiments the distance traversed by the light was 20 metres. The result obtained by him was 185,200 miles per second. Cornu's stations were about 14 miles apart. The result obtained by him was 186,600 miles, which exceeds the former by 1400 miles. The objection to Foucault's method is that the displacement, which enters directly in the formula, is very small, and therefore difficult to measure accurately. The objection to Fizeau's is that the total disappearance of the light was necessarily uncertain. The object of Mr. Michelson's experiments is to increase the displacement in the first method. This can be done in several ways: (1) By increasing the speed of the mirror; (2) by increasing the distance between the two mirrors; (3) by increasing the radius of measurement, *i. e.*, the distant from the revolving mirror to the scale. In Foucault's experiments the speed of the mirror was four hundred turns per second; the radius of measurement was about one meter, and the distance between the mirrors was about ten metres. The displacement obtained was about 0·8 millimetres. In Mr. Michelson's experiments the speed of the mirror was but one hundred and thirty turns per second, but the radius of measurement was from 15 to 30 feet, and the distance between the mirrors was about 500 feet. The displacement obtained varied from 0.3 of an inch to 0.63 of an inch, or about twenty times that obtained by Foucault. With a greater distance between the mirrors and a better apparatus he expected to obtain a displacement of 2 or 3 inches and to measure it to within one-thousandth part of an inch. Tables of observation of the velocity of light in air were given by Mr. Michelson, the mean result being 185,508 miles per second.—*Chem. News.*

## System of Ventilating and Purifying Sewers.

Mr. Robert Parker, surveyor to the Poplar District Board, has published some evidence in favor of the mode of ventilating sewers lately proposed by him.

The following is a statement of his ways of ventilating and purifying sewers and house-drains and water-closet soil pipes:—

*Main Sewers.*—Wherever ventilating shafts and reversible cowls can be fixed so as to force wind into the main sewers, the result will be a public benefit. Those, however, which are frequently surcharged, and in which the fluctuation of sewage is very considerable, must be excepted; for, during the time of the rapid accumulation of the sewage, an upward pressure is produced, which drives the foul air out of the ventilating grates. In such cases as these it would be advisable to construct small shafts at all convenient sites, to convey the foul air to a higher level, which would very much remove the source of complaints as to noxious vapors being discharged from main sewers, so as to be inhaled by passers-by.

*Sewers and Drains.*—I would suggest that the following methods be observed in applying my scheme in the purification of the above:—Suppose a street to be 700 feet in length, and to contain about seventy houses, and each house to have a separate drain into a sewer, such sewer being large enough for a man to walk through it. The rain-water pipes and kitchen sinks should not be connected direct with the house drains, but their contents should be discharged into the open air, or into trapped sinks placed beneath the kitchen sinks, and the yard sinks used for surface drainage. A ventilating pipe, 2½ inches in diameter, should be connected with the drain at the rear of each house, and continued to the apex of the roof and the soil-pipes of all water-closets situate above basement floors, should be ventilated by inserting a ¾-inch pipe as near to the closet-pan as circumstances will permit, which should be continued to or upon the roof of the premises. Suitable sites should be selected for the erection of two shafts, 9 inches internal diameter, upon each of which a reversible cowl should be placed, to force wind into the sewer and drains, to dilute the foul air previously to its passing through the ventilating pipe. This continuous motion would produce a thorough system of ventilating and purifying sewers and drains. In many cases the rain-water pipes could be used for ventilating pipes. If the sewer in the street be not large enough for a man to pass through it, the same principle as laid down in the previous case would apply.

*Combined Drainage.*—In the event of houses having been drained by a system of back-drainage of about eight or ten houses in a block, and the main drain passing through about the centre of them, a shaft should be erected at the end of such main drain, to receive a reversible cowl to force wind into the drains and the sewer; and if the sewer be large enough for a man to pass through it, a flap trap should be fixed at the outlet of the drain, with an aperture in it 3 inches in diameter, for the purpose of regulating the supply of wind—that is to say, as the wind is being forced into the sewer, a portion of it would pass through the ventilating pipes at the rear of the houses, and the remaining portion through the flap into the sewer, which would escape at the present ventilating grates. Supposing the sewer in the street to be 12, 15, or 18 inches in diameter, the wind that would be forced into the sewer would escape where it met with the least resistance through the branch sewers, and the ventilating pipes at the rear of the houses; or, should it be necessary, ventilating shafts could be constructed. On various occasions, during the course of my experiments herein referred to, when the velocity of the wind has been high, I have examined sink traps in and out of the houses, but have neither seen any motion in the water, nor detected wind escaping therefrom.—*The Builder.*

* By Albert A. Michelson, Ensign United States Navy, Annapolis. Read before the American Association for the Advancement of Science, Section A.

## Ammoniacal Liquor.

*To the Editor of the Chemical News—*

Sir: As it seems to be becoming more general among gas corporations and companies to sell their ammoniacal liquor, not at so much per degree of Twaddell's hydrometer as formerly, but on the basis of the actual strength of ammonia, and as one of these (Leeds, in a recently issued form of tender) is now stipulating that this shall be determined by the so-called "Wills's test," which consists in the old plan of boiling the ammonia into test acid with caustic soda, I think it desirable to draw the attention of those of your reader who may be interested to a paper published in the *Chemical News*, vol. xxxi., pp. 15 and 16, "On the Distillation of Ammonia in Presence of Sulphocyanides," in which it is experimentally proved that caustic soda tends to convert a portion of the sulphocyanide into ammonia; and that caustic lime, which has no such action and expels the ammonia quite as freely, should be substituted.

Should it not suffice in commercial contracts to specify that the actual percentage of valuable constituent shall be taken without stipulating that it shall be decided by a particular test which (as has been the case in this instance) may any day be demonstrated to be incorrect? I am, etc.,

ALEXANDER EASILMAN.

*Manchester, Sept.* 9, 1878.

**Gambetta is one** of the latest men to marry a gas-man's daughter for money. Thanks to Edison, the poor house returns will begin to show up a new trade among the inmates—gas company stockholders.

**The Criticism** of the gas companies upon Edison's electric light is that they "guess it won't be much of a shower."

## Prices of Gas Coal.

| | | |
|---|---|---|
| Waverly Youghiogheny | 5.25 | |
| Moore's " | 5.50 | |
| Shafton | 5.35 | |
| Despard Marion | 5.15 | |
| Newburgh Orrel | @ | 3.85 at Baltimore. |
| Murphy Run | 5.25 | |
| Chesapeake and Ohio Agency Coal | 5.25 | 4.00 at Richmond. |
| Newcastle | 3.75 @ 3.85 | |
| Provincial | 4.15 @ 4.50 | |
| Cannelton Cannel | 10.00 | |
| Ince Hall | 8.00 | |

## Gas Stocks.

**Quotations by G. W. Close Jr., Broker and Dealer in Gas Stocks.**
**(with W B Scott & Co.,)**

24 PINE STREET, NEW YORK CITY.

DECEMBER 16, 1878

☞ All communications will receive particular attention
☞ The following quotations are based on the par value of $100 per share. ☜

| *Gas. Co.'s of N. Y. City.* | *Capital.* | *Par.* | *Bid.* | *Asked* |
|---|---|---|---|---|
| Central | 466,000 | 50 | — | 75 |
| Harlem | $1,800,000 | 50 | 25 | 35 |
| " Bonds | 170,000 | | | 103 |
| Manhattan | 4,000,000 | 50 | 145 | 150 |
| Metropolitan | 2,500,000 | 100 | 100 | 105 |
| " Scrip | $1,000,000 | .. | 90 | 93 |
| Mutual | 5,000,000 | 100 | 55 | 65 |
| " Bonds, gold. | 900.000 | 1000 | 95 | 101 |
| Municipal | 1,500,000 | 100 | 75 | 80 |
| " Bonds | 750,000 | | 95 | 98 |
| New York | 4,000,000 | 100 | 80 | 85 |
| Northern | 270,000 | 50 | — | 100 |
| *Gas Co.'s of Brooklyn.* | | | | |
| Brooklyn | 2,000,000 | 25 | 115 | 120 |
| Citizens | 1,200,000 | 20 | 50 | 60 |
| " Scrip | 320,000 | 1000 | 90 | 95 |
| Peoples | 2,000,000 | 10 | 20 | 30 |
| " Bonds | $ 325,000 | ... | — | 95 |
| " Scrip | 300,000 | ... | 75 | 80 |
| Metropolitan | 1,000,000 | 100 | 50 | 60 |
| Nassau | 1,000,000 | 25 | 50 | 56 |
| " Ctfs. | 700,000 | 1000 | — | 90 |
| Williamsburgh | 1,000,000 | 50 | 70 | 80 |
| " Scrip | | ... | 88 | 92 |
| Kings Co | 200,000 | 100 | 80 | 90 |
| Union Co. E N. Y. | | 25 | — | 50 |
| Richmond Co., S. I. | 300,000 | ... | 60 | 85 |
| *Out of Town Gas Companies.* | | | | |
| Bath, Maine | 70,000 | 100 | | |
| Buffalo Mutual, N. Y | 750,000 | 100 | 65 | 70 |
| " Bonds | 200,000 | 1000 | 95 | 100 |
| Baltimore, Md | 2,000,000 | 100 | 95 | 98 |
| " Ctfs., gold | 1,000,000 | | 95 | 101 |
| Bayonne, N. J | | 100 | | 90 |
| Brockport, N. Y | 25,000 | 100 | ... | 80 |
| Citizens, Newark | 918,000 | 50 | 87 | 91 |
| " " Bds. | 124,000 | — | 105 | 107 |
| Chicago Gas Co., Ills | | | 128 | 130 |
| Cincinnati G & C Co | | | | 190 |
| Derby of Conn | 160,000 | 100 | 60 | 80 |
| East Boston, Mass. | | 25 | 114 | 120 |
| Elizabethtown, N. J. | 300,000 | 20 | — | 130 |
| Fort Wayne, Ind | | 100 | ... | — |
| Hannibal, Mo | 100,000 | 100 | 95 | 100 |
| Hartford, Conn | 700,000 | 25 | 140 | 148 |
| Hempstead, L I | 25,000 | 100 | ... | — |

| | | | | |
|---|---|---|---|---|
| Jersey City ..... ... | 386,000 | 20 | 120 | 130 |
| Jamaica, L. I..... | 25,000 | 100 | ... | — |
| Jacksonville, Ill..... | 120,000 | 50 | 82 | ... |
| Lewistown Maine... | 400,000 | 100 | 70 | 80 |
| Lima, Ohio,..... | 60,000 | 100 | — | ... |
| Bonds | 30,000 | | 90 | |
| Laclede St Louis Mo. | 1,200,000 | 100 | — | 75 |
| Long Branch..... | | 20 | 30 | 40 |
| New Haven, Conn... | | 25 | 136 | 152 |
| Peoples, Jersey City | | ... | — | 80 |
| " " Bds. | | | | 95 |
| Peoples of Albany... | 650,000 | 100 | 10 | 17 |
| " Bonds | 350,000 | 1000 | -- | - |
| Peoples of Baltimore | | 25 | 44 | 48 |
| " Bonds.... | | | 106 | — |
| Plainfield, N. J..... | 80,000 | 100 | — | 105 |
| Perth Amboy ..... | | 25 | — | 95 |
| Rochester. N. Y..... | | 100 | 50 | 60 |
| Woonsocket, R. I.... | 150,000 | 100 | 95 | ... |
| Halifax N. S..... | 400,000 | 40 | 148 | 150 |
| Hamilton, Ontario... | 150,000 | 40 | 117½ | |
| San Francisco Gas- | | | | |
| Co., S. Fr'isco Cal. | | | 95 | 95¼ |
| St. Louis, Missouri.. | 600,000 | 50 | 73 | 75 |
| Stillwater, Minn..... | 50,000 | 50 | — | 26 |
| Saugerties, N. Y .... | 15,000 | 100 | 95 | 100 |
| Troy, Citizens.. ..... | 600,000 | 100 | — | 60 |
| Toledo, Ohio..... | | | 95 | 97 |
| Washington, D. C... | | 20 | — | 200 |
| Yonkers..... | | 50 | 70 | 80 |

## Advertisers Index.


**GAS ENGINEERS.** Page.

William Farmer, New York City..... 287
George W. Dresser, New York City..... 287

**GAS WORKS APPARATUS AND CONSTRUCTION.**

Herring & Floyd, New York City..... 283
T. F. Rowland, Greenpoint, L. I..... 283
J. W. Starr & Son, Camden, N. J..... 283
Delly & Fowler Philadelphia, Pa..... 283
Kerr Murray, Fort Wayne, Ind..... 283
George Stacey & Co., Cincinnati, Ohio..... 283
Brown & Owen, Philadelphia, Pa..... 283
Mackenzie & Sayre Man'f'g Co..... 283
Bartlett, Robbins & Co., Baltimore, Md..... 279

**GAS AND WATER PIPES.**

McNeals & Archer, Burlington, N. J..... 282
Gloucester Iron Works, Philadelphia, Pa..... 282
Robt. Campbell & Co., New York City..... 282
James Marshall & Co Pittsburgh, Pa..... 282
R. D Wood & Co., Philadelphia, Pa..... 282
S. Decatur Smith, Philadelphia, Pa..... 282
H. R. Smith & Co., Columbus, Ohio..... 282
William Smith, Pittsburgh Pa..... 282
Warren Foundry and Machine Co..... 282

**PIPE CUTTING MACHINES.**

A. C. Wood, Syracuse, N. Y. ..... 285

**RETORTS AND FIRE BRICK.**

J. H. Gautier & Co., Jersey City, N. J..... 284
B. Kreischer & Sons, New York City..... 285
Adam Weber, New York City..... 284
Gardner Brothers, Pittsburgh Pa..... 284
Laclede Fire Brick Works, St. Louis, Mo..... 284
Brooklyn Retort and Fire Brick Works..... 284
Borgner & Obrien, Phila, Pa..... 285
Evens & Howard, St. Louis, Mo..... 285

**GAS METERS.**

Harris, Griffin & Co., Philadelphia, Pa..... 286
American Meter Co., Philadelphia, Pa..... 288
W. W. Goodwin & Co., Philadelphia, Pa..... 288
Harris, Heime & McIlhenny, Philadelphia, Pa..... 288

**VALVES.**

Ludlow Valve Manufacturing Co., Troy, N. Y..... 285

**EXHAUSTERS.**

P. H. & F. M. Roots, Connersville, Ind. ..... 284
Smith & Sayre Manufacturing Co., New York City..... 286

**GAS COALS.**

Penn Gas Coal Co., Philadelphia, Pa..... 281
Perkins & Co., New York City..... 280
Cannelton Coal Co., " " " " 281
New York & Cleveland Gas Coal Co., Pittsburgh, Pa..... 281
Newburgh Orrel Coal Co., Baltimore, Md..... 281
Despard Coal Co., Baltimore, Md..... 281
Tyrconnell Coal Co., Baltimore, Md..... 281
Fort Pitt Gas Coals..... 281
Chesapeake & Ohio R. R. Coal Agency..... 281

**GAS ENGINES.**

Schleicher, Schumm & Co., Philadelphia, Pa..... 280

**GAS SCREENS.**

Jas. P. Mahan, Boston, Mass..... 279

**BURNERS.**

C. H. Meyer & Co., Philadelphia, Pa. ..... 279
C. Gefrorer, Philadelphia, Pa..... 287

**PROCESSES.**

Gwynne Harris, New York City..... 283
Lowe, Philadelphia, Pa. ..... 286

**GAS FIXTURES.**

Mitchell, Vance & Co., New York City..... 287

**CEMENT.**

S. L. Merchant & Co., New York City..... 288

**BOOKS.**

Cathels, Gas Consumer's Manual..... 282
How to Burn Gas..... 287
Scientific Books..... 286
Fodell's Book-Keeping..... 288
Gas..... 280
Sanitary Engineer..... 288
Journal des Usines a Gaz..... 287

**ELECTRIC LIGHT.**

Arnoux & Hochhausen, New York City..... 279



**ARNOUX & HOCHHAUSEN,**

MANUFACTURERS OF

*DYNAMO ELECTRIC*

**MACHINES,**

FOR

**ELECTRIC LIGHTS**

2 & 4 HOWARD STREET,

CORNER CENTRE ST., NEW YORK.

Electric Lights have been furnished by us at MANHATTAN BEACH, GILMORE'S GARDEN, THE CATHEDRAL, THE NEW CAPITOL AT ALBANY, and at MACY'S.

**WANTED.**

**A PRACTICAL MAN AS SUPERINTENDENT**

OF A

**SMALL WORKS IN THE WEST.**

Must be able to run the Works, put in services, take Index, set Meters, do Fitting, and bring good Recommendations for Sobriety and General Good Character.

For particulars inquire at this office, **STATING SALARY EXPECTED.**

**WANTED---TO LEASE.**

AN ENGINEER OF 25 YEARS EXPERIENCE AS A BUILDER AND MANAGER,

**DESIRES TO LEASE A GAS WORKS**

For a term of years. Works must be of sufficient capacity to allow a fair compensation for money expended in necessary improvements and time spent in running them.

Please state in answer size of works, capacity of holder, size and length of street mains, cost of coal at works, number of street lamps in use and their price per year, date of construction of works, and any other information that may seem consistent. Please address **R. H. GARDNER,**

468 2m. Care AM. GAS-LIGHT JOURNAL.

**BARTLETT, ROBBINS & CO.,**

**ARCHITECTURAL IRON WORKS.**

MANUFACTURERS OF

GAS HOLDERS, BENCH CASTINGS, MULTITUBULAR WATER AND AIR CONDENSERS, COMMON AND TOWER SCRUBBERS, ROTARY & STEAM JET EXHAUSTERS, WROUGHT IRON ROOF FRAMES.

**MANUFACTURERS OF ALL DESCRIPTIONS OF GAS APPARATUS.**

*WORKS:*

Cors. Pratt, Scott, McHenry, Ramsay and Bartlett Streets.

**BALTIMORE, MARYLAND.**

Plans, Specifications, and Estimates furnished. Correspondence solicited. 467-1y

**KING'S TREATISE**

ON

**COAL GAS.**

Vol. I. Bound in Cloth.

**PRICE, $10.**

**A. M. CALLENDER & CO.,** 42 Pine Street, N. Y.

**A Gas Engineer,**

THOROUGHLY EFFICIENT IN EVERY BRANCH OF THE BUSINESS, OF GOOD CHARACTER AND HABITS, AND STRICTLY RELIABLE,

DESIRES TO CORRESPOND WITH GOOD PARTIES,

WITH VIEW TO AN ENGAGEMENT.

For further particulars address **G. E.,** care AM. GAS-LIGHT JOURNAL. 466-3t

**Duffee's Improved Gas Screen.**

**19 TREMONT ROW, BOSTON, MASS.**

JAMES P. MAHAN, Treasurer.

**CHAS. H. MEYER & CO.,**

**227 Chestnut Street, Philadelphia, Pa.,**

IMPORTERS OF

**LAVA TIPS AND SCOTCH TIPS**

ALL ORDER DELIVERED FREE TO NEW YORK

59-1y

**THE PLUMBER**

AND

**Sanitary Engineer**

Begins its Second Volume with the December issue, which contains a large and varied Table of Contents, including the following timely articles:

THE ELECTRIC LIGHT. Illustrated. Containing details of some very important experiments, just received from abroad. By Henry Morton, Ph.D., President of Stevens Institute of Technology.

FULL-PAGE PERSPECTIVE VIEW OF NEW SEVENTH REGIMENT ARMORY. Showing mode of lighting by gas or electric light, in response to request of Building Committee, with comparative cost of the same.

THE VENTILATION OF THE NATIONAL CAPITOL. By Robert Briggs, C.E.

THE FACTS ABOUT THE ALLEGED SUGAR ADULTERATIONS. By Prof. Morton.

THE SANITARY CONDITION OF TENEMENT HOUSES. By Col. Geo. E. Waring, Jr., C.E. With illustrations of a perpetual bever nest and a tenement house *cul de sac.*

THE WATER SUPPLY OF SMALL TOWNS. By Edw. S. Philbrick, C.E.

THE NECESSITY OF SEWER VENTILATION. By a distinguished Engineer.

TERMS OF A $500 COMPETITION AMONG ARCHITECTS for the Plan of a Model Apartment-house for Working People.

GAS NOTES. By T. O'Conor Sloane, Ph D.

THE SANITARY CORGRESS AT CHELTENHAM, ENGLANND.

BAD PLUMBING IN PHILADELPHIA.

TECHNICAL ARTICLES ON PLUMBING, interesting to Architects, Plumbers, and Householders.

Besides Editorials, Correspondence, Book Reviews, etc.

This Paper aims to enlighten the Public on all SANITARY SUBJECTS. Its Editorials are written for the average Householder. The Technical Articles are for the Engineer, Architect, and Mechanic. So far as it treats of Gas-Lighting, it aims to throw light where many other journals think it to their interest to mislead and spread darkness

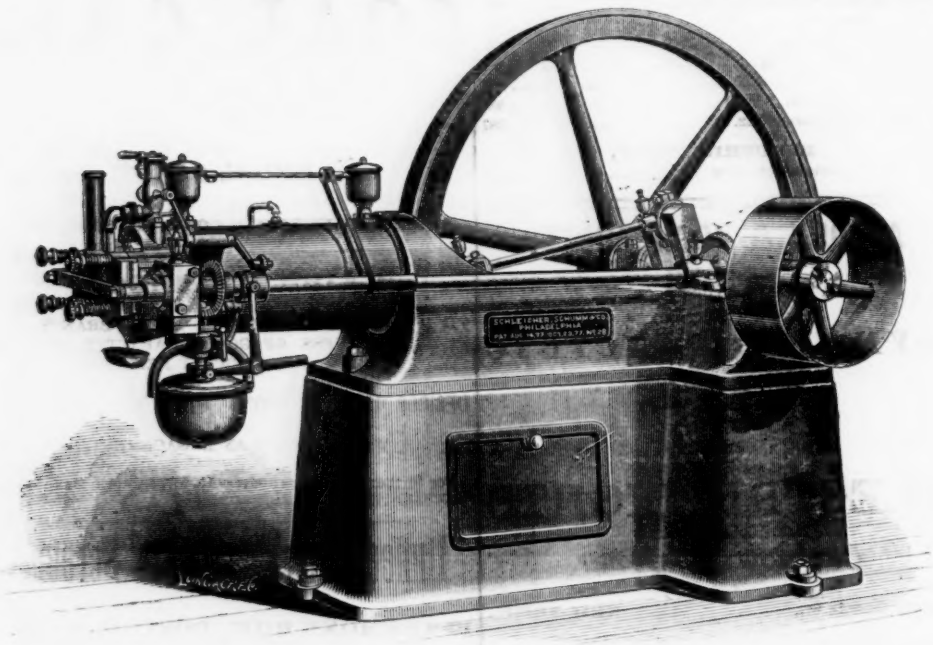
Published monthly, at $1.50 year. Single copies, 15 cents. Address,

**THE PLUMBER AND SANITARY ENGINEER,**

P. O. BOX 3037 NEW YORK.

# SILENT GAS ENGINE.

*Always Ready to be Started, and to give at once Full Power.*



NO STEAM TO MAKE OR MAINTAIN.

NO COAL, NO ASHES, NO DIRT.

NO FIRE, NO DANGER, NO EXTRA INSURANCE.

NO GAUGES, NO PUMPS, NO LEAKAGES.

ALMOST NO ATTENDANCE.

**BURNS COMMON GAS.**

*AVERAGE CONSUMPTION PER HORSE POWER,*

**21 1-2 Cubic Ft. Per Hour.**

COSTS NOTHING WHILE STANDING, LITTLE WHILE RUNNING WITHOUT DOING WORK, AND WHILE WORKING THE GAS IS PRECISELY REGULATED BY THE GOVERNOR IN PROPORTION TO THE POWER DEVELOPED.

SIZES AT PRESENT OFFERED, **2, 4 and 7 H. P.**
**LARGER SIZES TO ORDER.**

## THE NEW OTTO SILENT GAS ENGINE.

**Unexcelled for Convenience and Economy in running Gas Exhausters, Tar and Ammonia Pumps, Hoists in Warehouses or Stores, Ventilating Theatres, Halls and Buildings, Driving Electro-Magnetic Machines,**

And useful generally for all work of small stationary steam engines. Where work is intermittent, trouble with a steam boiler and engine is at its maximum, but with a gas engine. For particulars, prices, etc., apply to

**SCHLEICHER, SCHUMM & CO.,**
**3045 Chestnut Street, Philadelphia.**

## NEWCASTLE AND PROVINCIAL GAS COALS.

THE UNDERSIGNED ARE PREPARED TO EXECUTE ORDERS FOR

**NEWCASTLE COAL** (NEW PELTON),

ALSO FOR THE BEST QUALITIES OF

## PROVINCIAL GAS COAL,

DELIVERED AT ANY PORT IN THE UNITED STATES.

We supplied nearly 100,000 tons of Provincial Coal to some twenty-five different Gas Companies in 1877. These coals will yield in practical use fully

***10,000 Cubic Feet of 16 1-2 Candle Gas---40 Bushels Coke.***

JAMES D. PERKINS.
F. SEAVERNS.

**PERKINS & CO.**

45 SOUTH STREET, NEW YORK

## GAS.

We would respectfully call attention to a pamphlet which we have published for distribution among gas consumers, in the expectation of increasing the Gas Consumption, by answering the questions most often asked over the counter, as well as for introducing the use of gas for Cooking, Heating and Manufacturing purposes.

We would solicit an order, feeling sure that a promotion of knowledge among the public generally of the ease and comfort of Gas, in its many uses, will increase the demand, and largely repay the small cost of distribution. We will print with your imprint, and with such alterations as you may wish, in any quantity at the following rates:

| | |
|---|---|
| 500 . . | $20 |
| 1000 . . . | 35 |
| 2000 . . | 60 |

Single copies 10 cents.

Copies furnished from this Office direct.

## NEW YORK AND CLEVELAND
# GAS COAL COM'Y
### Of Pittsburgh, Pa.

MINERS AND SHIPPERS OF

**YOUGHIOGHENY GAS COAL.**

This Company is prepared to furnish any amount of their justly celebrated, and acknowledged superior GAS COAL, to any point reached by railroad or navigation, on most favorable terms.

**General Office—89 Wood Street,**
PITTSBURGH, PA.

**Branch Office—120 Water Street,**
CLEVELAND, OHIO.

WILLIAM A. McINTOSH, President.
A. CARNEGIE, Vice-President.
W. P. DE ARMIT, Treasurer.
THOMAS AXWORTHY, Agent
351-1y at Cleveland, Ohio.

---

THE NEWBURGH

## Orrel Coal Company,

Mines at Newburg, Preston County, W. Va.
Company's Office, No. 52 S. Gay Street, Baltimore, Md.
C. OLIVER O'DONNELL, Pres't. CHAS. MACKALL, Sec'y.
CHAS. W. HAYS, Agent in New York, Room 7, Trinity Building, 111 Broadway.

This Company offer their very superior Gas Coal at lowest market prices.

It yields 10,996 cubic feet of gas to the ton of 2,240 lbs. of good illuminating power, and of remarkable purity; one bushel of lime purifying 6,792 cubic feet, with a large amount of coke of good quality.

It has been for many years very extensively used by various Gas Companies in the United States, and we beg to refer to the Manhattan, Metropolitan, and New York Gas Light Companies of New York; the Brooklyn and Citizen's Gas Light Companies of Brooklyn, N. Y.; the Baltimore Gas Light Company of Baltimore, Md., and the Providence Gas Light Company, Providence, R. I.

Best dry coals shipped from Locust Point, wharves, and prompt attention given to orders for chartering of vessels.
224-1y n

---

## THE DESPARD COAL COMPANY
OFFER THEIR SUPERIOR
### DESPARD COAL

To Gas Light Companies throughout the country.
Agents, PARMELEE BROTHERS, No. 32 Pine street, N. Y.
BANGS & HORTON, No. 31 Duane street, Boston.
Mines in Harrison County, West Virginia.
Wharves Locust Point, } Baltimore.
Company's Office, 15 German St., }

Among the consumers of Despard Coal, we name: Manhattan Gas Light Company, New York; Metropolitan Gas Light Company, New York; Jersey City Gas Light Company, N. J.; Washington Gas Light Company; Portland Gas Light Company, Maine
*.* Reference to them is requested. 204-.

---

## TYRCONNELL GAS COAL.,
*MINED IN TAYLOR COUNTY, WEST VA.*

**Company's Office, 52 S. Gay St., Baltimore.**
CHARLES MACKALL, Secretary.
CHARLES W. HAYS, Agent, Room 7, 111 B'way, N. Y.
SHIPPING POINT—Baltimore, Md.

This coal yields 10,000 cubic feet of Gas with an illuminating power of over 16 candles. Forty bushels of very superio Coke, with little Ash and scarcely any clinker 54-1y

---

## FORT PITT GAS COAL

This Company is prepared to supply any amount of their
*Celebrated Gas Coal*
to all points reached by rail or lake throughout the West.

**THE FORT PITT COAL COMPANY,**
OFFICE 337 LIBERTY STREET,
484-1y PITTSBURGH PA.

---

GAS OALS.

## THE
# *PENN GAS COAL COMPANY*

OFFER THEIR

## COAL, CAREFULLY SCREENED,

AND PREPARED FOR

# GAS PURPOSES.

Their Property is located in the Youghiogheny Coal Basin, near Irwin's and Penn Station on the Pennsylvania Railroad, and on the Youghiogheny River.

OFFICES

**No. 11 Merchants Exchange, Phil'a., 90 Wall Street, New York.**

PLACES OF SHIPMENT.

**Pennsylvania Railroad, Pier No. 2 (Lower Side).**
**Greenwich Wharves, Delaware River.**
366-1y **Pier No. 1 (Lower Side), South Amboy, N. J.**

---

# CANNELTON COAL COMPANY
### OF WEST VIRGINIA.

Offer for sale the following Coals, from their Colliery at CANNELTON, Kanawha County West Virginia delivered at RICHMOND, Va.:

## CANNELTON CANNEL,

acknowledged to be the most valuable ENRICHER produced in this country, a gross ton yielding 10,000 cubic feet of GAS of 64·54 CANDLE POWER; COKE 32 bushels, of good quality.

## CANNELTON CAKING COAL.

*MAXIMUM YIELD*, 5.06 cubic feet of Gas per pound of Coal—A yield of 4·78 cubic feet per lb.—gave 16 14-100 Candle-Power.

COKE, of very fine quality—1453 pounds produced from one ton of coal.

**J. TATNALL LEA,** Treasurer, P. O. Box 1747 Philadelphia.
SALES AGENTS { **PERKINS & CO.,** 45 South Street, N. Y.; **DANIEL W. JOB & CO.,** 91 State Street, Boston. **H. W. BENEDICT & SON,** New Haven.

---

# PERKINS & CO.,
## 45 SOUTH STREET, N. Y.

IMPORTERS AND AGENTS FOR THE SALE OF

## AMERICAN, PROVINCIAL, and ENGLISH
## GAS COALS AND CANNEL.

JAMES D. PERKINS. F. SEAVERNS, JR.

---

# CHESAPEAKE AND OHIO RAILWAY
## COAL AGENCY.

FOR THE SALE OF THE SUPERIOR

# KANAWHA GAS COALS,

ALSO,

## CANNEL, SPLINT, and STEAM COALS.

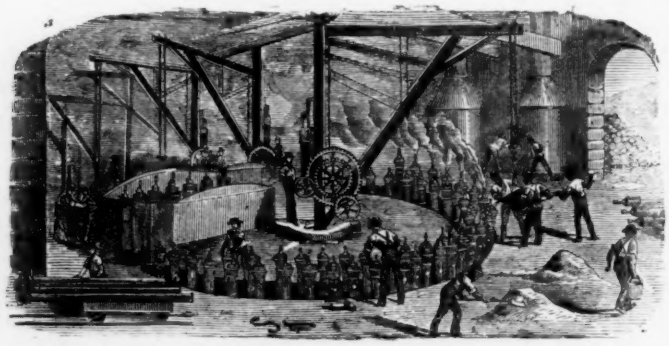
From the Kanawha and New River Regions, on the Line of the Chesapeake and Ohio Railway.

C. B. ORCUTT, Secretary. } OFFICE No. 7 WALL ST., NEW YORK
J. J. GORDON, Sales Agent. }

# M'NEALS & ARCHER,

BURLINGTON. N. J,

Flange-Pipes



Ceneral Foundry Work.

## CAST IRON PIPES

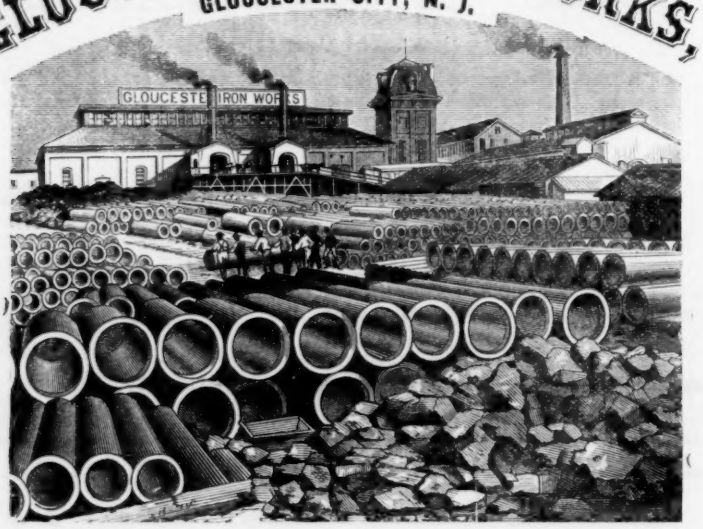
FOR WATER AND GAS.

DAVID S. BROWN, President.
BENJAMIN CHEW, Treasurer.

JAMES P. MICHELLON, Secretary,
WILLIAM SEXTON, Superintendent.

# GLOUCESTER IRON WORKS,

GLOUCESTER CITY, N. J.




CastIron Gas & Water Pipes, Stop Valves, Fire Hydrants, Gas Holders. &c.

Office No. 6 North Seventh Street, Philadelphia.

ESTABLISHED 1856.

## WARREN FOUNDRY AND MACHINE CO,,

WORKS AT PHILLIPSBURGH, N, J.
NEW YORK OFFICE, 153 BROADWAY.

## *Cast Iron Water and Gas Pipe*

FROM TWO TO FORTY-EIGHT INCHES DIAMETER.
ALSO ALL SIZES OF

**FLANGE PIPE for Sugar House and Mine Work.**

Branches, Bends, Retorts, Etc., Etc. 436-1

## H. R. SMITH & CO.,

COLUMBUS, OHIO,

MANUFACTURERS OF

## CAST IRON GAS & WATER PIPE,

BRANCH CASTINGS, LAMP POSTS, Etc.

(Pipe from three inch and upwards cast *vertically* in 12 feet lengths.)

**HEAVY AND LIGHT CASTINGS OF ALL KINDS.**

*DAILY CAPACITY* 125 *TONS.*

☞ Our Works *connect direct* with *eleven railroads* centering in this city, giving us unequalled facilities for shipping to points, at the lowest rates freight.

## NATIONAL FOUNDRY

AND PIPE WORKS.

OFFICE AND WORKS—CARROLL, PIKE, SMALLMAN AND WILKINS STREETS,

PITTSBURGH, PA

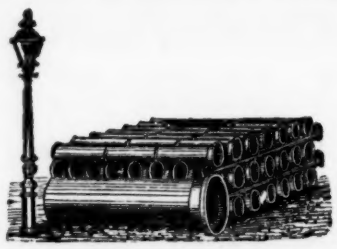
## WM. SMITH,

Manufacturer of all kinds of GAS and WATER PIPE BRANCHES, CONNECTIONS, T's, ELBOWS, and all CASTINGS USED AT GAS AND WATER WORKS,

We offer special inducements to parties wishing to purchase. My Pipe is Smooth, regular in weights, and cast vertically.

N. B.—Pipe from 3 inch and upwards, cast in 12-ft. lengths.

☞ SEND FOR CIRCULAR AND PRICE LIST.



## R. D. WOOD & CO..

PHILADELPHIA.

MANUFACTURERS OF

## CAST IRON PIPE

FOR GAS AND WATER

Lamp Posts. Valves, Etc.

Mathew's Pat. Anti-Freezing Hydrants.

*400 Chestnut Street.*

## JAMES MARSHALL & CO.

**Franklin Foundry and Pipe Works,**

MANUFACTURERS OF

**GAS, WATER, AND OIL PIPES**

Works, 18th, 19th, 20th and Railroad Street.
Office, No. 23 Nineteenth Street.

Pittsburgh, Pa.

N.B.—Pipes from 3-inch and upwards cast in 12 ft. lengths.

☞ Send for Circular and Price List.

## BERGEN IRON WORKS.

ROBT. CAMPBELL & CO.

MANUFACTURERS OF

## CAST IRON PIPES,

FOR WATER AND GAS,

Valves, Fire and Dock Hydrants,
Lamp-Posts and Flange Work,
Bench Castings for Gas Works, &c.

Office 112 Leonard Street, N. Y.

## S. DECATUR SMITH,

CAST IRON GAS and WATER PIPE,

Foundry, Cor. of York and Moyer Streets,

PHILADELPHIA.

Several Thousand 2, 3, 4, 6 and 8 Inch Cast Iron *Gas and Water Pipes* on hand. for immediate delivery.

☞ FITTINGS FOR GAS AND WATER MAINS.

## CATHEL'S

## GAS CONSUMERS MANUEL.

Enables every Gas Consumer to ascertain at a glance, without any previous knowledge of the Gas Meter, the quantity and money value of the Gas consumed. Also the best method of obtaining from Gas the largest amount of its light.

It will be to the advantage of Gas Companies to supply their Consumers with one of these Guides, as a means of preventing complaints arising from their want of knowledge in regard to the registration of their meters. For sale by

A. M. CALLENDER & CO.,
42 Pine Street, New York Room 18.

MURRAY & BAKER,

**Practical Builders,**

**And Contractors for the Erection of Gas Works,**

MANUFACTURERS OF ALL THE LATEST AND MOST IMPROVED APPARATUS AND TOOLS FOR THE MANUFACTURE & DISTRIBUTION OF COAL GAS.

☞ WORKS AT THE RAILWAY DEPOTS,

**FORT WAYNE, INDIANA.**

We manufacture Bench Castings, Washers, "The Immersed Multitubular," and Atmospheric Condensers, Wet and Dry-Lime Purifiers, Dry Center Seals, Telescopic and Single Gas Holders, Wrought Iron Trussed Roof for Iron or Slate, Wood and Iron Trays for Purifiers, Coke and Coal Carts, Wrought Iron Screening Shovels and Castings, and Wrought Work of every description for Gas-Works.

As Mr. Murray is a Practical Draughtsman, we will furnish plans and specifications to parties or associations, or will wait personally upon parties contemplating the construction of new works, or the alteration or extension of old ones

The most satisfactory references can be given, if required of the experience and commercial fairness which characterizes our dealings.

We would respectfully invite Western men to call and see our patterns and works here. MURRAY & BAKER,
Fort Wayne, Indiana

GEO. STACEY. HENRY RANSHAW WM. STACEY

**GEO. STACEY & CO.**

MANUFACTURERS OF SINGLE AND TELESCOPIC

**GAS-HOLDERS.**

AND ALL KINDS OF

**Cast and Wrought Iron Work**

Used in the Erection of Gas and Coal Oil Works.

Foundry on MILL STREET; Nos. 33, 35, 37 and 39.
Office and Wrought Iron Works on RAMSAY STREET Cincinnati, Ohio.

REFERENCE.

| | |
|---|---|
| Cincinnati Gas-Light Co. | Baton Rouge, La., Gas Co. |
| Indianapolis Gas Co. | Saginaw, Mich., Gas Co. |
| Dayton, O., Gaslight Co. | Oshkosh, Wis., Gas Co. |
| Covington, Ky., Gas Co. | Peoria, Ill., Gas Co. |
| Springfield, O., Gas Co. | Quincy, Ill., Gas Co. |
| Terre Haute, Ind., Gas Co. | Champaign, Ills., Gas Co. |
| Madison, Ind., Gas Co. | Carlinville, Ill., Gas Co. |
| Kansas City, Mo., Gas Co. | Bowling Green, Ky., Gas Co |
| Topeka, Kansas, Gas Co. | Hamilton, Ohio, Gas Co. |
| Burlington, Iowa, Gas Co. | Vicksburg, Miss., Gas Co |
| Nashville, Tenn., Gas Co. | Denver City, Col., Gas Co. |

R. T. Coverdale, Eng'r Cincinnati and others.

**BROWN & OWEN,**

MANUFACTURERS OF

EVERY DESCRIPTION OF

**Gas and Water Works Supplies.**

Particular attention given to the alterations of old works
Estimates and Drawings furnished.
Address all communications to

**N. W. Cor. 12th and Noble Streets,**

420–1y **PHILADELPHIA.**

**HERRING & FLOYD,**

**Oregon Iron Foundry**

738, 740, 742 and 744 Greenwich St,, N. Y

MANUFACTURERS OF

**ALL KINDS OF CASTINGS**

AND

**APPARATUS FOR GAS-WORKS.**

**BENCH CASTINGS**
from benches of one to six Retorts each.

**WASHERS: MULTITUBLAR AND AIR CONDENSERS: CONDENSERS; SCRUBBERS,**

wet and dry), and

**EXHAUSTERS**
for relieving Retorts from pressure.

**BENDS and BRANCHES**
of all sizes and description.

FLOYD'S PATENT
**MALLEABLE RETORT LID.**

SABBATON'S PATENT
**FURNACE DOOR AND FRAME.**

SELLER'S CEMENT
for stopping leaks in Retorts.

GAS GOVERNORS,

and everything connected with well regulated Gas Works, at low price, and in complete order.

N. B.—**STOP VALVES** from three to thirty inches—very low prices.

SILAS C. HERRING. JAMES R. FLOYD.

**1842. DEILY & FOWLER 1878.**

***LAUREL IRON WORKS.***

ADDRESS, 39 LAUREL STREET,

**PHILADELPHIA.**

MANUFACTURERS OF

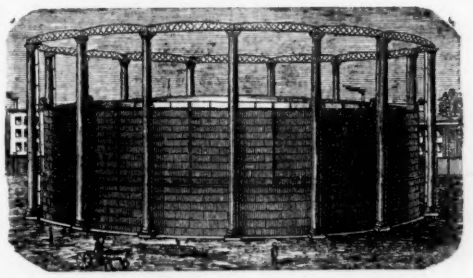
**GAS HOLDERS,**

*SINGLE AND TELESCOPIC—WITH CAST OR WROUGHT IRON GUIDE FRAMES.*

We are prepared to furnish Holders, Wrought Iron Roof Frames, Bench Castings, Condensers, Scrubbers, Purifiers, Drips, Bends, Tees, and all other Iron Work connected with Gas Works. Previous to 1868 our Mr. D. built *nine Gas Works* and *fifty-four Holders*. Since that date we have built *three Gas Works* and *forty-six Holders*. We *superintend in person* the erection of all our work, and would refer to the Gas Companies at the following places, where we have built Holders since 1868:

| | |
|---|---|
| Lancaster, Pa. | Barnesville, O. |
| Williamsport, Pa. | Franklin, Ind |
| Bristol, Pa. | Jacksonville, Ill. (2) |
| Catasaqua, Pa. | Joliet, Ill. |
| Kittanning, Pa. | Lawrence, Kansas. |
| Hazelton, Pa. | Jefferson City, N. O., La |
| Freeport. Pa. | Algiers, N. O., La. |
| Huntingdon, Pa. | Kalamazoo, Mich |
| Pittston, Pa. | Buffalo, N. Y. |
| Bethlehem S). Pa. | Ogdensburg, N. Y. |
| Sharon, Pa. | Waverly, N. Y. |
| Canton, Pa. | Little Falls, N. Y. |
| Annapolis, Mo. | Penn Yann, N. Y |
| Parkersburg, Wes. | Watkins, N. Y. |
| Lynchburg, Va. | Gloucester, N. J. |
| Youngstown, O | Salem, N. J. |
| Steubenville, O. | Mount Holly, N. J. |
| Zanesville, O. | Plainfield, N. J. |
| Mansfield, O. | Englewood, N. J. |
| Marion, O. | Dover, Del. |
| Bellealre, O. | Pittsfield, Mass. |
| Athens, O. | Meriden Conn- |

**CONTINENTAL WORKS.**



GASHOLDERS OF ANY MAGNITUDE.

T. F. ROWLAND, Proprietor,

GREENPOINT, BROOKLYN, N. Y.

ENGINEER AND MANUFACTURER OF

**GAS-HOLDERS,**

CONDENSERS, SCRUBBERS, VALVES, PURIFIERS, RETORTS, and HYDRAULIC MAINS,

and all other articles connected with the Manufacture and Distribution of Gas. Plans and Specifications prepared, and Proposals given for the necessary Plans for Lighting Cities Towns, Mansions, and Manufactories.

**NATIONAL COAL GAS COMPANY.**

320 Broadway, N. Y., Rooms 50, 51 & 52.

Elevator on Pearl Street.

**H. P. ALLEN, President.**

The process known as GWYNNE-HARRIS but from later most essential improvements more appropriately called the ALLEN-HARRIS, or AMERICAN HYDROCARBON process for making "Water Gas," by the decomposition of superheated steam, in fire-clay retorts, set similarly to those in Coal Gas Works, is an established success. More than One Hundred Million cubic feet of gas have been made under this process, and for *permanency* and *brilliancy*, as well as economy both to the manufacturer and consumer, it is superior to any gas made by the old, or any other method.

Our process is *not intermittent* but continuous. The steam and the oil are admitted into the retorts by gauge cocks, and run for days without change. All the materials required, besides the steam, are 17 lbs. of Anthracite coal and about 3½ gallons of Petroleum or Naphtha, per 1000 feet of brilliant gas.

Rights for sale. Inquire of the President.

JESSE W STARR & SON,

**Camden Iron Works**

**Camden, New Jersey,**

**Office in Philadelphia No. 435 Chestnut St., where a member of the Firm can be seen between 12 m. and 2 p. m. daily.**

MANUFACTURERS OF

ALL KINDS OF CASTINGS AND APPARATUS FOR GAS WORKS,

**Wrought Iron Roof Frames,**

For Retort and other houses. Retorts and all castings quired for setting them in the latest and most improve model. WASHERS, CONDENSERS, SCRUBBERS and EXHAUSTERS for relieving the Retorts from pressure. PURIFIERS, varying from 2,000 to 2,000,000 cubic feet daily purifying capacity.

**Wrought Iron Lime Sieves**

for Purifiers. Station Meters of all sizes.

**GAS HOLDERS.**

TELESCOPIC AND SINGLE

With cast iron guide and suspension frame GAS GOVERNORS or REGULATORS, STREET MAINS, from 1½ 48 INCHES DIAMETER, for WATER or GAS. Street Main connections, such as BRANCHES, BENDS, DRIPS, SLEEVES, etc.

STOP VALVES, from 3 to 30 inches, for both Water and Gas.

**Wrought Iron Work.**

All the Smith and Sheet Iron work required in and about Gas Works. 226-tf

JESSE STA JESSE W. STARR, Jr.,

**MACKENZIE & SAYRE MAN'F'G CO.,**

**141 BROADWAY, NEW YORK.**

**Gas Works, Smelting Works & Machinery.**

Proprietors of P. W. MACKENZIES PROCESS AND APPARATUS for making Illuminating Gas from Ordinary Gas Coals, enriched with Cannel or Oil. Also, Mackenzies Process for Making Heating Gas for Smelting, Melting, Puddling, Forges, Boilers, Etc. Also,

**P. W. Mackenzie's New Engine and Boiler.**

434—1y

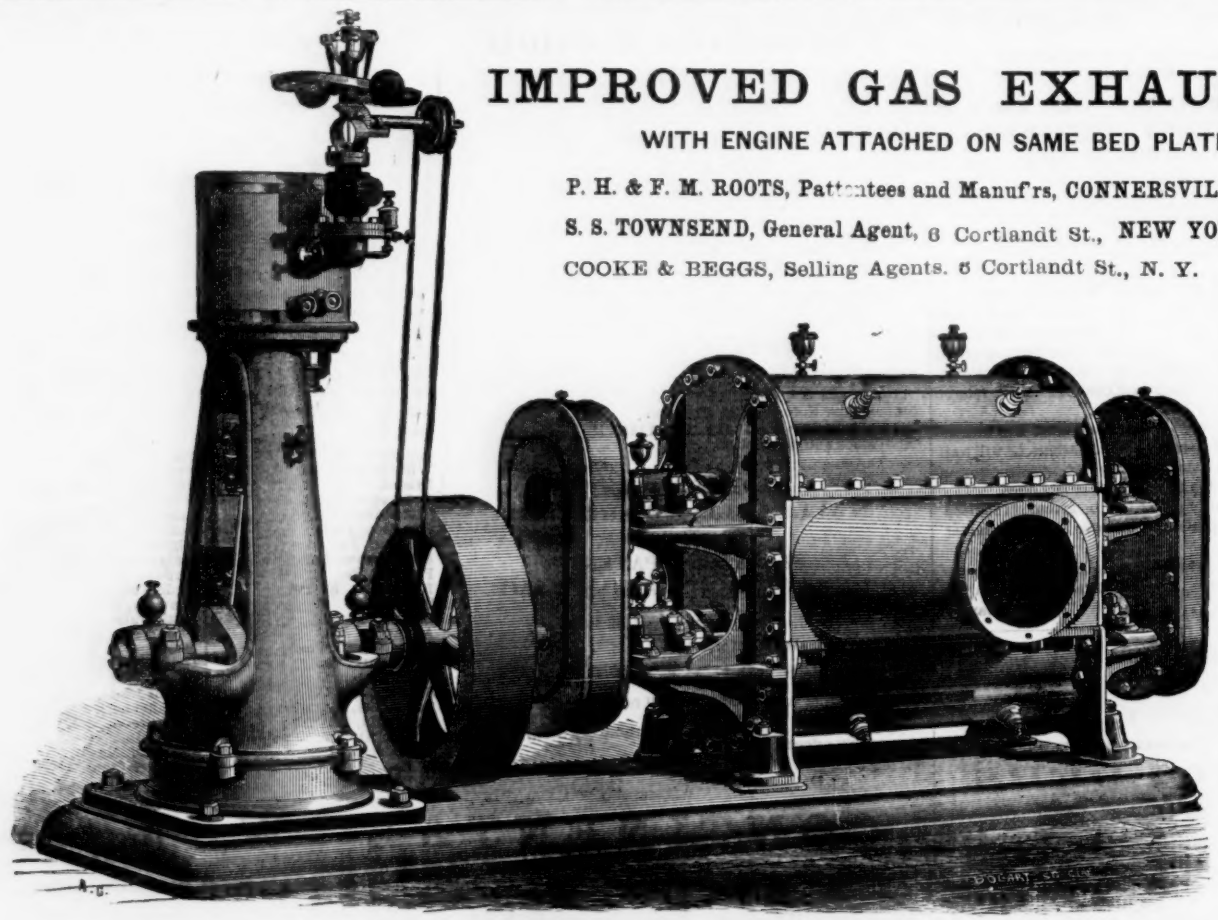
# IMPROVED GAS EXHAUSTER,

WITH ENGINE ATTACHED ON SAME BED PLATE.

P. H. & F. M. ROOTS, Patentees and Manufrs, CONNERSVILLE, IND.

S. S. TOWNSEND, General Agent, 6 Cortlandt St., NEW YORK

COOKE & BEGGS, Selling Agents. 6 Cortlandt St., N. Y.



**ADVANTAGES CLAIMED FOR THIS EXHAUSTER.**

1. It is simpler than any other Exhauster. The internal operating parts consist of only two pieces, cast entire, and can not get out of order.
2. Every part requiring care or attention, is external and easily accessible. All changes, adjustments, and repairs are made from the outside.
3. The revolvers, though practically gas-tight, do not run in actual contact, hence there is no friction, and a great saving of power effected.
4. They are built in the most complete and substantial manner, and of any required size, with steel shafts and improved journal bearings.
5. We furnish Exhausters and Engines combined on same Bed Plate, as shown above, or the Exhauster only, as may be required.
6. We also furnish Bye Passes and Gas Valves on improved plans, also Exhauster Governors and Elbows, Pipes, Drawings, etc.

Send for Illustrated Catalogue, giving details of capacity, speed, power required, price, and references to parties using them.

P. H. & F. M. ROOTS.

---

**J. H. GAUTIER & CO.,**

CORNER OF

GREENE AND ESSEX STREETS,

*JERSEY CITY, N. J.*

MANUFACTURERS OF

**Clay Gas Retorts,**

**Gas House Tiles,**

**Fire Bricks, Etc. Etc.**

**Ground Clay, Fire Brick and Fire Sand in Barrels,**

*ALWAYS ON HAND.*

J. H. GAUTIER.
C. E. GREGORY

398-1y

---

**Brooklyn Clay Retort**

AND

**FIRE-BRICK WORKS.**

Manufacturers of Clay Retorts, Fire Bricks, Gas House and other Tile, Cupola Brick, etc. Dealers in and Miners of Fire Clay and Fire Sand. Clay bank at Burt's Creek, New Jersey. Manufactory: Van Dyke, Elizabeth, Richards and Partition Streets, Brooklyn, N. Y.—Office, No. 88 Van Dyke Street.

---

**LACLEDE**

FIRE BRICKS AND

**GAS RETORT WORKS**

CHELTENHAM, MO.

Hand and Machine made Retorts and Settings, Superior Fire Bricks for Siemans Gas and Glass Furnace. Bricks and Tiles for Whitwell's Hot Blast Ovens, Blast Furnace and Cupola Tiles, Etc.

*Fire Bricks and Tiles*

of all shapes and sizes.

Glass Pot Clay. Fine Ground Clay and Fire Bricks. Sewer Pipe, Etc.

**901 Pine Street, St. Louis, Mo.**

642—

---

**MANHATTAN**

FIRE BRICK & ENAMELLED CLAY

**RETORT WORKS.**

ADAM WEBER,

(Successor to MAURER & WEBER.)

PROPRIETOR.

Office and Works, 15th Street, Avenue C.

Manufactures of

**FIRE BRICK AND TILES,**

Of all shapes and sizes.

FIRE MORTAR, CLAY AND SAND.

☞ Articles of every description made to order at short notice. 1y5t.

---

Works: LOCKPORT, PA.

*Established 1864.*

Works: MT. SAVAGE JUNCTION, MD.

**GARDNER BROTHERS,**

**Manufacturers of Clay Gas Retorts and Retort Settings**

**"STANDARD SAVAGE"**

**Fire Brick, Tile and Furnace Blocks,**

AND

**MINERS AND SHIPPERS OF FIRE CLAY.**

Sole Agent for New England,
C. H. SPRAGUE,
86 State Street, Boston.

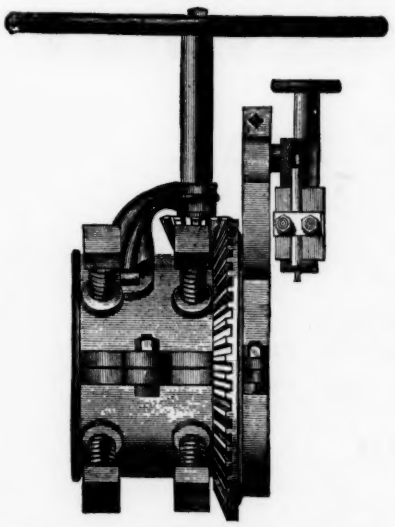
OFFICE: No. 376 PENN AV'E., PITTSBURGH, PA.

# A. C. WOOD'S
# CAST IRON PIPE CUTTER

PATENTED MAY 23rd, 1876.

*PRICES REDUCED TO MEET THE TIMES.*

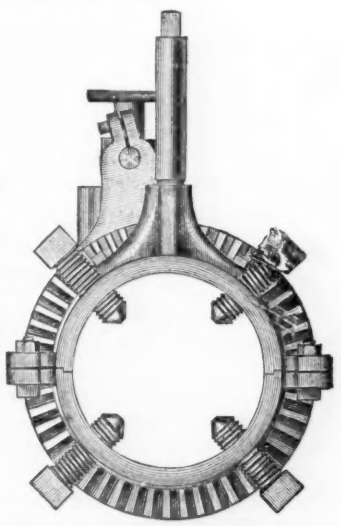
We have been able to reduce the cost of Manufacturing, and desire to give our Customers the benefit at the following



**REDUCED RATES:**

*No. 1 cuts 3, 4 and 6 inch Pipe $75*
*No. 1 1-2 cuts 4, 6 and 8 in. Pipe, $85*
*No. 2 cuts 8, 10 and 12 in. Pipe, $100*
*No. 3 cuts 16, 18 and 20 in. Pipe, $225*
*NO. 4 cuts 24 and 30 inch Pipe, $275*
*No. 5 cuts 36 inch Pipe, $350*

*For larger sizes Special Contracts will be made.*



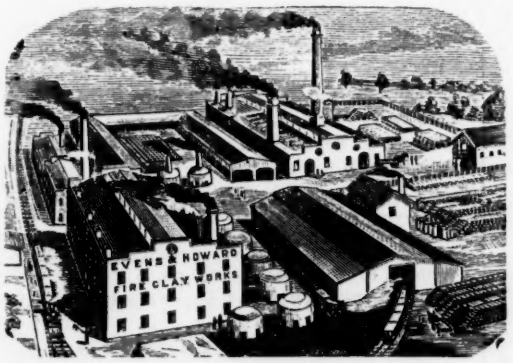
**It will cut a Continuous Line of Pipe in a Trench or Building**

As well as loose Cast or Wrought Iron Pipe, Shafts or Columns of any size, leaving the ends clean, smooth, and square.

Our Machines for cutting 20 and 30-INCH PIPE have been furnished the Manhattan and New York Gas Light Companies; also for cutting 12, 20, and 30 inch Pipe to the Boston Gas-Light Company. The smaller sized Machines have been in practical use in various parts of the country by Water and Gas Companies, for over two years, and all with the most satisfactory results. Address

A. C. WOOD, Syracuse, New York.
HERRING & FLOYD, No. 744 Greenwich street, N. Y.
BROWN & OWEN, 20th and Filbert Sts., Philadelphia.
MORRIS, TASKER & CO., 36 Oliver Street, Boston, Mass.

## EVENS & HOWARD,




**GAS RETORTS.**
**FIRE BRICK,**
*Retort Fittings,*
**FURNACE & CUPOLA LININGS**
OF EVERY DESCRIPTION.
Sewer Pipe and Drain Tile.
FINEST QUALITY GLASS HOUSE POT CLAY A SPECIALTY.
916 MARKET STREET, ST. LOUIS.

THROUGH CARS LOADED AT FACTORY FOR ALL ACCESSIBLE POINTS,

## LUDLOW
## Valve Manf'g Co.,

OFFICE AND WORKS
938 to 954 River Street and 67 to 83 Vail Ave.
TROY, NEW YORK.

**BRASS AND IRON SLIDE VALVES.**

(Double and Single Gate ⅛ inch to 36 inch—outside and inside screws, Indicator etc.) for Gas, Water and Steam—
HYDRAULIC MAIN DIP REGULATORS.
ALSO
**FIRE HYDRANTS.**

*Established in 1845.*

## B. KREISCHER & SONS,

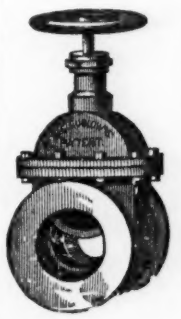
Office Foot of Houston Street, E. R., N. Y.

## GAS RETORTS, TILES and FIRE BRICK

*Of all Shapes and Sizes.*

**FIRE MORTAR, CLAY and SAND.**

ARTICLES OF EVERY DESCRIPTION MADE TO ORDER AT THE SHORTEST NOTICE.



REFERENCES FURNISHED.
SEND FOR CIRCULARS.

## BORGNER & O'BRIEN,

MANUFACTURERS OF

**Clay Gas Retorts and Retort Settings, Fire Bricks, Tiles, Etc.**

TWENTY-THIRD STREET BELOW VINE—PHILADELPHIA.

18 Years Practical Experience. GAS-HOUSE WORKS a Specialty. 445

## INTERNATIONAL--1876--EXHIBITION.

# The U. S. Centennial Commission

HAVE DECREED AN AWARD TO

# *HARRIS, GRIFFIN & CO.,*

**12th and Brown Sts., Philadelphia, and 49 Dey St., N. Y., U. S, A..**

FOR THE FOLLOWING REASONS:

The Exhibit consists of a Series of METERS from the Largest Size Station Meters for the use of the MANUFACTURE OF GAS, to those for the use of the ORDINARY CONSUMER. The Instruments are WELL MADE, RELIABLE as to INDICATION, and embody a number of sundry improvements which, with the general character of the Exhibit, entitle the whole to commendation.

Attest—J. L. CAMPBELL, Secretary, pro-tem. Signed—A. T. GOSHORN, Director General J. R. HAWLEY, President.

GROUP JUDGES.

*AMERICAN.*

PROF. JOSEPH HENRY, LL.D., Secretary of Smithsonian Institution, Washington, D. C.
PROF. F. A. P. BARNARD, S.T.D., LL.D., President of Columbia College, N. Y.
PROF. J. E. HILGARD, Washington, D. C.
PROF. J. C. WATSON, Ann Arbor, Michigan.
GENERAL HENRY K. OLIVER, Salem, Massachusetts.
GEORGE F. BRISTOW, New York.

*FOREIGN.*

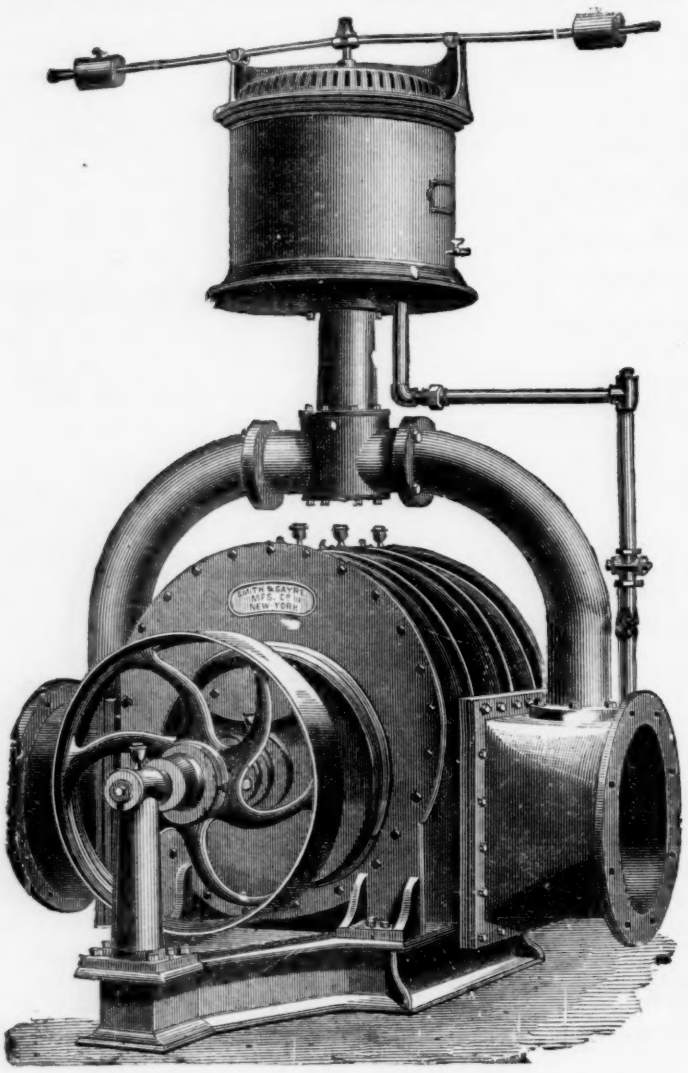
SIR WILLIAM THOMSON, LL.D., D.C.L., F.R.S., Great Britain.
JUL. SCHIEDMAYER, Germany.
MR. E. LEVASSEUR, France.
P. F. KUPKA, Austria.
EDW. FAVRE PERRET, Switzerland.

**SMITH & SAYRE MANUFACTURING COMPANY.**

Coal and Iron Exchange, 21 Cortlandt Street, N. Y.

BUILDERS OF

## Machinery and Apparatus for Gas Works.




MACKENZIE'S PATENT ROTARY GAS EXHAUSTER, STEAM JET EXHAUSTER and CONDENSER, WASHERS and SCRUBBERS.
MACKENZIE and ISBELL'S PATENT DEODORIZING PROCESS.
ISBELL'S PATENT GAS and WATER STOP VALVES.
ISBELL'S AUTOMATIC STREET PRESSURE GOVERNOR, Pressure Regulator for High Districts. Compensators, Governors, By-Passes, Pressure and Vacuum Gauges. Pipes, Tees, and Bends. Steam Engines, Boilers, Pumps and Heaters.
PLANS, DRAWINGS and SPECIFICATIONS furnished.
Send for Prices and Information.
G. G. PORTER, President.
CHARLES W. ISBELL, Secretary. Office, Coal and Iron Exchange Building, Cortlandt cor. New Church Sts.

## SCIENTIFIC BOOKS.

We are prepared to furnish to GAS MANAGERS and others interested in the topics treated of, the following Books, at prices named:

**GAS MANUFACTURE,** by WILLIAM RICHARDS, 4 to, with numerous Engravings and Plates, in Cloth binding. $12.

**INSTRUCTIONS FOR THE MANAGEMENT OF GAS WORKS,** by W. C. HOLMES. 8 vo- Cloth $1.50

**ANALYSIS, TECHNICAL VALUATION, PURIFICATION and USE OF COAL GAS,** by Rev. W. R. BOWDITCH, M. A., with Engravings. 8 vo Cloth. $4.50.

**NEWBIGGINS HAND BOOK,** by THOMAS NEWBIGGIN, C. E. $3.75.

**GAS CONSUMERS HAND BOOK,** by WM. RICHARDS, C. E. 18 mo. Sewed. 20 Cents.

**GAS CONSUMERS MANUAL,** by E. S. CATHELS, C.E 10 Cents.

**PRACTICAL TREATISE ON HEAT,** by THOMAS BOX. Second edition. $5.

**AIR AS FUEL,** OR PETROLEUM AND OTHER MINERAL OILS UTILIZED BY CARBURETTING AIR, by OWEN C. D. ROSS, Member Institute Civil Engineers. 8 vo. Cloth. $1.50.

**A PRACTICAL TREATISE ON ELECTRIC LIGHTING,** by HIPPOLYTE FONTAINE. Translated from the French by Paget Higgs, LL.D., Assoc. Inst. C.E. $3.

The above will be forwarded by Express. upon receipt of price.

We will take especial pains in securing and forwarding any other Works that may be desired, upon receipt of order. All remittances must be made by Check, Draft, or Post Office Money Order.

**A. M. CALLENDER & CO.,**
Room 18, No. 42, Pine Street, N. Y.

# THE LOWE GAS PROCESS.

**S. A. STEVENS & CO,**

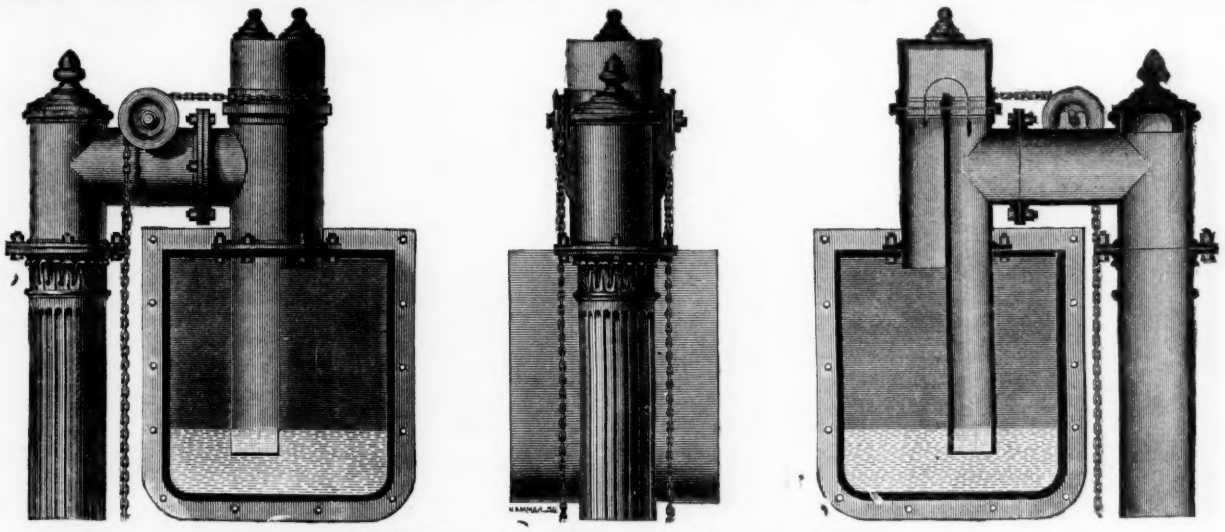
SOLE AGENTS.

**ROOM 87, ASTOR HOUSE.**

P. O. Box 1110, NEW YORK.

AND

400 430 WALNUT STREET, PHILADELPHIA.



FARMER'S PATENT BYE-PASS DIP-PIPE.

# WILLIAM FARMER,

## ARCHITECT AND GENERAL GAS ENGINEER,

**ROOMS 87, 89, 91, 111 BROADWAY, NEW YORK.**

WILLIAM FARMER may be consulted upon all matters relating to the Manufacture of Illuminating Gas. Will furnish Specifications, Drawings, and Estimates for the Erection of Gas Works of any Capacity, and will erect the same either on Commission or by Contract.

Having made the Construction of Gas Works a Specialty, perfect satisfaction can be guaranteed.

Sole Agent for the FOULIS HYDRAULIC MACHINE for Drawing and Charging Retorts.

Sole Agent for the AITKEN and YOUNG PROCESS FOR MAKING ILLUMINATING GAS.

PATENTEE OF THE FOLLOWING INVENTIONS.

**EXHAUSTER** (Screw Propeller) for Gas or Air, and Condensation. **DUMPING BARROW** for Wheeling Coal, Coke and Lime, Etc. **HYDRAULIC MAIN** for Reducing Pressure on Retorts. **ZIGZAG SCRUBBERS** for Naphthalizing the Gas and Removing the Tar, Ammonia, and Naphthaline. **BYE-PASS DIP PIPE** for reducing the Pressure on Retorts, Etc., as per cut above. **SELF-ACTING WATER DISTRIBUTOR** for Scrubbers and Washers, Etc. **MOVABLE DIP PIPE** for Reducing and Equalizing the Pressure on Retorts. **TOWER SCRUBBERS** (Jacketted) for Economizing Space and Building Material. **DUPLEX CENTRE SEAL** for Keeping all the Boxes in a set continuously in action.

REFERS BY PERMISSION TO THE FOLLOWING GENTLEMEN.

Professor B. SILLIMAN, New Haven, Conn.
GEN. CHAS. ROOME, President Manhattan Gas-Light Company, N. Y.
GEN. A. HICKENLOOPER, President Cincinnati Gas-Light Co., Cincinnatti, Ohio.
A. W. BENSON, President Brooklyn Gas-Light Company, Brooklyn, N. Y.
D. HOSTETTER, President Pittsburgh Gas-Light Co., Pittsburgh, P.
C. VANDERVOORT SMITH, Engineer Manhattan Gas-Light Company, N. Y.
S. L. HUSTED, President Laclede Gas-Light Company, St. Louis, Mo.
E. VANDERPOOL, Engineer, Newark Gas-Light Company, Newark, N. J.

## C. GEFRORER.

Manufacturer of

**GAS BURNERS,**

GAS HEATING AND COOKING APPARATUS.

FITTERS' PROVING APPARATUS. ETC

No. 248 North Eighth Street, Philadelphia

## GEO. W. DRESSER,

## CIVIL ENGINEER.

TRINITY BUILDING

ROOM 89. 111 BROADWAY.

## How to Burn Gas.

Under this title a neat little book has been issued containing the paper of Mr. Jas. Somerville, as read at the last meeting at Cincinnati, together with a table, taken from Prof. Chandler's lecture showing the loss of light resulting from the use of shades, etc., of different kinds of glass.

The book is intended for sale to Gas Companies to distribute gratuitously among consumers. If Gas Companies can induce their consumers to use better burners and shades, one-half of the fault-finding will cease.

The price is $10 per thousand. Orders may be sent to the office of this Journal.

## MITCHELL, VANCE & CO.

Manufacturers of

**CHANDELIERS!**

And Every Description of

GAS FIXTURES,

Also Manufacturers of

Fine Gilt Bronze and Marble Clocks, warranted best Timekeepers Mantle Ornaments, &c.

**Salesroom, 836 BROADWAY.**

NEW YORK

Special designs furnished for Gas Fixtures for Churches Public Halls, Lodges, &c.

ADVANTAGES OF THE STRAP FILE.

1st. It is simple, strong, and easily used.
2nd. Preserves papers without punching holes.
3rd. Will always lie flat open.
4th. Allows any paper on file to be taken off, without disturbing the others.

We will furnish to our subscribers this important article for *preserving in a convenient form*, the numbers of the Journal as it is issued at the very low price of $1.25. Sent either by Express or Mail, as directed.

By mail the postage will be 20 cents, which will be added to the price of the Binder. Send orders to

A. M. CALLENDER & CO.,
42 Pine Street, Room 18, New York.

# JOURNAL des USINES a GAZ.

**ORGANE DE LA**

***Societe Technique de L'Industrie du Gaz en France.***

ISSUED ON THE 5TH OF EACH MONTH.

**MESSRS. SERVIER, MONNIER, AND ROUGET, EDITORS AND MANAGERS.**

THIS JOURNAL CONTAINS ALL THE LATEST SCIENTIFIC AND PRACTICAL INFORMATION RELATING TO GAS MANUFACTURE IN FRANCE.

**Subscriptions Received at this Office.** **Price, Post-paid, $3.50 Per Annum.**

## *THE AMERICAN GAS-LIGHT JOURNAL.*

***Three dollars.***

**PER ANNUM.**

T. C. HOPPER, Pres't and Gen'l Sup't. WM. H. HOPPER, Vice Pres't. WM. N. MILSTED, Treas. WM. H. DOWN, Secy

# AMERICAN METER COMPANY,

MANUFACTURERS OF

**Wet and Dry Gas Meters, Pressure Registers, Pressure and Vacuum Registers, Meter Provers, Pressure and Vacuum Gauges of all description, Exhauster Governors, Experimental and Glazed Dry Meters, Sugg's Illuminating Power Meters, Cresson's Gas Regulators, Station Meters, Dry Centre Valves, Governors for Gas Works, Ammonia Test Meter and Apparatus, Bar and Jet Photometers, Etc., Etc.**

**Agencies.**
37 Water Street, Cincinnati.
20 South Canal Street, Chicago.
2028 Clark Avenue, St. Louis.

**Sole Agents for W. Sugg's Photometrical and Analytical Gas Apparatus, Standard London Argand Burners and Double N Burner.**

**A full assortment kept at the Manufactories and Agencies, where orders may be addressed.**

**American Meter Co.**
512 West 22nd Street, N. Y.
Arch and 22nd Street, Phil'a.
122 and 124 Sutter Streets, San Francisco, Cal.

## HARRIS, HELME & McILHENNY,

Successors to Harris & Brother.

ESTABLISHED 1848.

## PRACTICAL GAS METER MANUFACTURERS,

Continue as heretofore at the OLD ESTABLISHMENT, Nos. 1115 and 1117 Cherry Street, Philadelphia, Pa.

To manufacture Wet and Dry Gas Meters, Station Meters, Experimental Meters, Meter Provers, Centre Seals, Governors, Pressure Registers, Indicators, Photometers, and all kinds of Gas Apparatus; Also furnish all other Articles appertaining to the use of Gas Works.

*From our long Practical Experience of the Business (covering a period of 28 years) and from our personal supervision of all Work, we can guarantee all orders to be executed promptly, and in every respect satisfactorily.*

WASHINGTON HARRIS. WILLIAM HELME. JOHN McILHENNY.

## WILLIAM W. GOODWIN & CO.

***No. 1012, 1014 and 1016 Filbert Street, Philadelphia, Pa.***

***No, 142 Chambers Street, New York***

MANUFACTURERS OF

Dry and Wet GAS METERS, Station Meters (Square, Cylindrical or in Staves) Glazed Meters, King's and Sugg's Experimental Meters, Lamp Post Meters, Etc., Etc., Meter Provers (sizes 2, 5 and 10 feet), Pressure Guages of all kinds, Pressure Registers, Pressure and Vacuum Registers, Pressure Indicators (sizes 4 inch, 6 inch and 9 inch), King's Pressure and Vacuum Gauges, Dry and Wet Centre Seals, Dry and Wet Governors, Exhauster Governors, Photometers of all descriptions. Letheby's Sulphur and Ammonia Test Apparatus complete—also Testing and Chemical Apparatus of all kinds, and of the most perfect description, for all purposes relating to Gas.

### Goodwin's Improved Lowe's Jet Photometer.

W. W. Goodwin is the author of the History and Principles involved in the use of Lowe's Jet Photometer Also Patentee and we are the SOLE MANUFACTURERS of the ORIGINAL and ONLY DIAL whereby the CANDLE POWER and PRESSURE can be instantly read, and all others are infringements

Special attention to repairs of Meters, and all apparatus connected with the business.

All work guaranteed first class in every particular, and orders filled promptly.

## THE PLUMBER

AND

## SANITARY ENGINEER.

CHAS. F. WINGATE, Editor.

DEVOTED TO THE DISCUSSION OF QUESTIONS OF

**SANITARY ENGINEERING, WATER SUPPLY, DRAINAGE, HEATING, AND LIGHTING.**

**Published Monthly at $1.50 Per Annum.**

This Paper aims to enlighten the public on all SANITARY SUBJECTS. Its Editorials are written for the average House-holder. The Technical Articles are for the Engineer, Architect, and Mechanic. So far as it treats of Gas-Lighting, it aims to throw light where many other journals think it to their interest to mislead and spread darkness.

Among its regular contributors are MR. F. S. PHILBRICK, C. E., Boston; ROBT. BRIGGS, C. E., Philadelphia · COL. GEO. E. WARING, Sanitary Engineer, Newport, R. I.; and other able Specialists.

SPECIMEN COPIES SENT FREE ON APPLICATION.

THE AMERICAN PUBLISHING CO., JAMES BUNTING, Manager.
No .297 Pearl Street, New York.

***Portland Cement,***
***Roman Cement.***
***Keene's Cemen ,***
***Sellurs Gas Cement.***
**English Fire Brick, No. 1.**
**" Silica Fire Brick.**

IMPORTERS.

**S. L. MERCHANT & CO.,**
**53 Broadway, New York,**
**Just below Trinity Church.** 344-1y

☞ Remit 10 cents postage for "Practical Treatise on Cement."

NOW READY AND FOR SALE,

**FODELL'S**

**System of Bookkeeping**

FOR GAS COMPANIES.

Price $5, which should be sent either in Check P. O. Order or Registered Letter.

Blank Books, with printed headings and forms on this system, will be supplied to Gas Companies, by applying to W. P. FODELL Philadelphia, or

A. M. CAGLENDER & CO
Office GAS-LIGHT JOURNAL, 42 Pine St., N. Y.